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U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, Secretary

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Donald A. Schon, *Director*

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

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AD 601 689 - AD 602 301

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-601 723 Div. 1, 17
OTS Price $0.75

Naval Research Lab., Washington, D. C.
FRACTURE ANALYSIS OF A C-141 LANDING GEAR CYLINDER.
Memo. rept.,
by C. D. Beachem. Apr 64, 24p
NRL MR1524

Unclassified report

Descriptors: (*Hydraulic cylinders, Fracture (Mechanics)), (*Landing gear, Hydraulic cylinders), Transport planes, Steel, Surface properties, Stresses, Fatigue (Mechanics), Hydrogen embrittlement, Grain structure (Metallurgy).

A fracture analysis was conducted on the fracture surface portion of a broken outer cylinder of a nose landing gear that was manufactured for use in the C-141 but broken in the laboratory. The nose-gear outer cylinder fractured due to (1) the presence of a small surface crack and several small submerged cracks, all of which were intergranular, and (2) the high stresses imposed during the test. The presence of these cracks probably considerably reduced the number of cycles to failure in this specimen. The cracks were quite possibly, but not definitely, due to the presence of hydrogen and residual stresses during plating or during the test. (Author)

AD-601 735 Div. 1, 9
OTS Price $2.50

Norair Div., Northrop Corp., Hawthorne, Calif.
LFC AIRPLANE OPERATIONAL AND COST ANALYSIS.
Final rept.
by R. Wingert. Apr 64, 103p NOR 61 143
Contract AF33 600 42052

Unclassified report

Descriptors: (*Transport planes, Air force), (*Laminar flow, Control), (*Aerodynamic control surfaces, Design), Drag, Reduction, Flight control systems, Operation, Maintenance, Economics, Aerodynamic configurations, Model tests, Costs.

This report presents operational, maintenance, and cost analyses of transport/cargo class aircraft equipped with Laminar Flow Control for reduced drag based on analytical studies and results of the X-21A LFC airplane demonstration program. Actual X-21A results were used to the maximum extent possible in these analyses; however, technical problems involving the fabrication of LFC surfaces to the required waviness tolerance and a leading edge flow instability phenomenon which developed during this program served to limit the scope of scheduled tests, particularly those relating to operational and maintenance requirements of LFC systems. For this reason, the operational and maintenance analyses are supplemented with results of analytical studies and wind tunnel or laboratory tests. Further testing with the X-21A airplanes has been proposed to resolve these technical problems, and to demonstrate operational suitability and maintainability of the LFC system in environments normally encountered by service-type aircraft. (Author)

AD-601 755 Div. 1
OTS Price $26.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DYNAMICS OF THE AIRPLANE,
by V. P. Vetchinkin. 30 Apr 64, 584p
FTD TT63 727, TT 64 19167

Unclassified report

Dinamika Samoleta; unedited rough draft trans. of Vetchinkin, V. P. Izbrannye Trudy (USSR) 1956, v. 1, 422p.

Descriptors: (*Aeronautics, Documentation), Atmosphere, Wing-body configurations, Flight paths, Aircraft landings, Take-off, Aircraft tires, Vehicle brakes, Vibration isolators, Mathematical analysis, Level flight, Descent, Climbing, Velocity, Fuel consumption, Jet propulsion, Rockets, Thrust, Aerodynamic configuration, Wind tunnels, USSR.

The theoretical aspects and problems of flight dynamics are discussed and analyzed. Subjects considered are (1) the atmosphere; (2) fundamental aerodynamic data; (3) the motion of aircraft on and near the ground; (4) pancake landings; (5) the undercarriage; (6) motion in the vertical plane; (7) turns and helices; (8) fuel consumption; (9) jet aircraft dynamics; (10) the vertical motion of rockets; (11) the flight of winged rockets at supersonic speeds; and (12) longitudinal vibrations and dynamic stability of aircraft. (Author)

AD-601 777 Div. 1
OTS Price $0.50

Systems Engineering Group, Research and Technology Div., Wright-Patterson AFB, Ohio.
APPLICATION OF A ROTATIONAL-PROBABILITY ANALYSIS FOR DETERMINATION OF ULTIMATE DESIGN LOADS ON LARGE, FLEXIBLE, MILITARY AIRCRAFT.
Rept. for Oct 63-Mar 64,
by William H. Austin, Jr. May 64, 10p
SEG TDR64 24

Unclassified report

Descriptors: (*Gust loads, Mathematical analysis), (*Tails (Aircraft), Loading (Mechanics)), (*Airframes, Failure (Mechanics)), Design, Dynamics, Environment, Probability, Life expectancy, Statistical distributions, Aviation accidents, Aircraft.

Recent experiences with B-52 aircraft have indicated that the current structural design criteria are inadequate for large, flexible, military aircraft. A rational-probability analytical procedure was established to overcome this problem. This analysis determines ultimate loads for which the vehicle must be designed in order to achieve the specified acceptable failure rate due to structural overload. The basis for the analysis is the acceptable failure rate, the dynamic spectral analysis, and the spectral exceedance curves. By use of this analysis, mission and performance trade-offs can be established in terms of probability of failure due to structural overload. With some modification, it is believed that this type of analysis can, and should, be applied to all types of aircraft. (Author)

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AD-601 903 Div. 1, 28
OTS Price $3.00

Bell Helicopter Co., Fort Worth, Tex.
ALTIMETER DISPLAY STUDY. PART III: SUMMARY OF EXPERIMENTAL TESTING.
Final rept., May 60-Jan 62
by C. B. Elam, W. G. Matheny and D. A. Schum. May 64, 190p
Contract AF33 616 8236, Proj. 6190, Task 619008
ASD TDR63 623 P3

Unclassified report

Descriptors: (*Altimeters, Display systems), (*Flight instruments, Altimeters), Instrument dials, Instrument panels, Cockpits, Design, Effectiveness, Test methods, Aviation personnel, Psychometrics, Tests, Statics, Dynamics, Experimental data.

Results of five altimeter display studies (four by static presentation and one by cinematic presentation) are described. The five altimeter display designs evaluated were: The Three-Pointer MA-1, the Horizontal Drum-Pointer, the Single Tape-Pointer, the Vertical Drum-Pointer - MD-1, and the Dual Tape instrument. Methods of evaluation were varied extensively. Measurements of errors and response time were taken for all studies. Results were generally in agreement that the following order of goodness prevails: (1) Single-Tape Pointer, (2) Horizontal Drum-Pointer, (3) Vertical Drum-Pointer (MD-1) and (4) Three-Pointer (MA-1). (Author)

AD-601 909 Div.1
OTS Price $2.25

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF INTERIM CONTROL PROCEDURES FOR PROPOSED ILS INSTALLATIONS AT KENNEDY AIRPORT ON RUNWAY 13L AND ON RUNWAY 13 AT LAGUARDIA AIRPORT.
Final rept.,
by R. C. Conway. Jun 64, 88p
Proj. 101 174 01V
FAA RD64 87

Unclassified report

Descriptors: (*Instrument landings, Terminal flight facilities), (*Air traffic control systems, Control simulators), (*Control simulators, Air traffic control systems), Air traffic, Airports, Runways, Tests, Control.

This report describes a simulation effort for the evaluation of interim control procedures that were developed to serve a proposed Instrument Landing System (ILS) installation on runway 13L at Kennedy International Airport and a proposed ILS installation on runway 13 at LaGuardia Airport without major revision to the total Metroplex. The simulation was conducted using the model B dynamic air traffic control simulator. Two plans were tested, using four different runway combinations, for the purpose of determining the more efficient procedures. It was concluded that both plans are considered to be equally efficient as interim control procedures. It was recommended that consideration be given to using these interim installations in the New York Metroplex. (Author)

AD-601 989 Div. 1
OTS Price $0.75

David Taylor Model Basin, Washington, D. C.
WIND-TUNNEL INVESTIGATION OF THE EFFECTS OF THRUST, SHROUD LENGTH, AND SHROUD CAMBER ON THE STATIC STABILITY CHARACTERISTICS OF SHROUDED PROPELLERS.
by Arthur E. Johnson. Apr 64, 25p
DTMB Aero-1073

Unclassified report

Descriptors: (*Shrouded propellers, Propellers, (aerial)), Thrust, Camber, Wind tunnels, Pressure, Lift, Pitch (Motion), Experimental data, Propeller blades, Aircraft engines, Spinners, Tests, Stability, Geometric forms.

Several related shroud profiles were tested, including uncambered, and positively and negatively cambered, to determine effects of geometric variables and thrust coefficient. Thrust coefficient and shroud length were found to affect slopes of lift curve and pitching-moment curve in agreement with trends but not with all actual numerical values predicted by existing theory. Propulsive efficiency was measured for shroud-propeller-center body combination and base pressure of body.

AD-602 015 Div. 1
OTS Price $2.60

Tactical Air Command, Langley AFB, Va.
OPERATIONAL TEST AND EVALUATION, MANUAL RELEASE ASSEMBLY, MA-5/6 LAP BELTS.
by Robert E. Sapp and Charles T. Hensarling. May 64, 24p
TAC TR64 14

Unclassified report

Descriptors: (*Ejection seats, Safety harness), (*Safety harness, Ejection seats), (*Release mechanisms, Ejection seats), Pilots, Failure (Mechanics), Military requirements Specifications, Aviation safety, Design.

The suitability and acceptability of the redesigned manual release assembly, MA-5/6 Lap Belt were tested and evaluated. Normal missions were flown in F-100 aircraft to test the suitability of this belt for both ground and airborne operations. The design of the manual release assembly was favorably received by most aircrews but is unacceptable in its present configuration. The test showed that the belt requires modification in order to be compatible with existing personal equipment.

AD-602 018 Div. 1
OTS Price $2.50

Kaman Aircraft Corp., Bloomfield, Conn.
FEASIBILITY INVESTIGATION OF HARMONIC DRIVE SPEED REDUCERS FOR HELICOPTER APPLICATIONS.
May 64, 116p Kaman R446
Contract DA44 177TC16 Task 1D121401D14414
TRECOM TR64 12

Unclassified report

Descriptors: (*Transmissions, Feasibility studies), (*Helicopter engines, Drives), Helicopters, Transmission gears, Army aircraft, Vibration, Noise, Reliability, Costs.

The report presents applicable helicopter and harmonic drive parameters, feasibility comparisons, data concerning the engineering and designing of a test unit, results of the test program, and recommendations for further research for improved efficiency. As a result of preliminary studies, parametric analysis, and actual testing of a harmonic drive unit designed for 250 horsepower at 30,000 r.p.m. input speed with 85:1 reduction ratio, it is concluded that: (1) from the standpoints of compactness, quietness, vibration level, simplicity, reliability, and cost, harmonic drive appears to be not only feasible but superior to conventional planetary gearing, and (2) in the present state of the art, power losses associated with the hydrodynamic wave generator bearing result in significantly lower efficiency than conventional gearing.

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

AD-601 785 Div. 1
OTS Price $0.50

Tactical Air Command, Langley AFB, Va.
OPERATIONAL FEASIBILITY EVALUATION OF AIRCRAFT LAUNCH AND ARRESTED LANDING EQUIPMENT.
Jun 64, 19p
TAC TR63 71

Unclassified report

Descriptors: (*Catapults, Feasibility studies), (*Arresting gear, Feasibility studies), (*Landing mats, Aluminum), Launching, Aircraft landings, Aircraft, Air force research, Landing fields.

A limited short term evaluation of aircraft launch catapults and aircraft rapid cycle arresting gear installed on aluminum air field mat was made. The aircraft catapult as evaluated was unsuitable for use by USAF tactical forces. It was not compatible, when rigged for operation, with operational arresting gear; had slow launch rates; had an undemonstrated reliability factor; and was not capable of launching the F-4 series aircraft at their maximum gross weights. The arresting gear operated in a satisfactory manner. Installation of this type or similar gear at USAF bases with heavy F-4C traffic appears feasible and worthwhile for recovery of aircraft during hazardous conditions. The AM2 aluminum runway mat is suitable for C-130 and F-4C operations provided it is installed on a good subgrade. (Author)

AD-601 811 Div. 1
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DETAIL OF SOVIET LANDSCAPE; YESTERDAY, TODAY, AND TOMORROW; THE TU IN THE SKIES OF ITALY,
by M. Mil', Oleg Morskov, and S. Eremin. 14 May 64, 12p
FTD TT64 322, TT 64 11804

Unclassified report

Unedited rough draft trans. of Grazhdanskaya aviatsiya (USSR) 1963 [v. 20] no. 12, p. 14-15.

Descriptors: (*Transport planes, USSR), (*Civil aviation, USSR), (*Helicopters, History), Design, Aircraft, Flight, Italy.

AD-601 835 Div. 1
OTS Price $3.00

Bell Helicopter Co., Fort Worth, Tex.
ALTIMETER DISPLAY STUDY. PART II: HANDBOOK FOR STATIC TESTING OF ALTIMETERS.
Final rept., May 60-Jan 62
by C. B. Elam, W. G. Matheny, and D. A. Schum.
May 64, 151p
Contract AF33 616 8236, Proj. 6190, Task 619008
ASD tdr63 622 P2

Unclassified report

Descriptors: (*Altimeters, Captive tests), (*Flight instruments, Display systems), (*Instrument dials, Altimeters), Test methods, Test equipment, Design, Tests, Handbooks, Data.

A discussion is presented of test procedures which gives an overall background for the static testing of altimeter display and for analyzing and reporting of data. Instructions are given for carrying out the tests. The recommendations given throughout are drawn from results of the series of tests in evaluating test procedures. (Author)

AD-601 860 Div. 1, 27
OTS Price $1.25

Aeronautical Engine Lab., Naval Air Engineering Center, Philadelphia, Pa.
AIRESEARCH MODEL GTCP100-52-1 POWERPLANT CALIBRATION AND EXTREME TEMPERATURE STARTING TESTS.
Final rept.
by W. V. Stetz and J. P. Malriat. 25 Jun 64, 44p
NAEC-AEL 1767

Unclassified report

Descriptors: (*Auxiliary power plants, Gas turbines), (*Gas turbines, Auxiliary power plants), Calibration, Starting, Tests, Low temperature research, Fuel consumption, Ground support equipment, Aircraft, Model tests.

Powerplant calibrations, including JP-5R fuel consumption determinations, were conducted at compressor inlet air temperatures of 3, 58, and 130F at 100 percent speed using shaft and compressed air loadings. Output is acceptable. Fuel consumption was determined also during no-load operation at various steady state speeds at compressor inlet air temperatures of -22F to 130F. Starting tests were conducted at test temperatures of -32F to +125F using JP-4R and JP-5R fuels and 24-volt 36-ampere-hour batteries. Starting was unsatisfactory at low temperatures due to exhaust flaming, excessive turbine out temperatures and unstable operation. It was improved by reducing fuel flow, using a higher capacity electrical power supply and employing warm fuel. Operation of the fuel metering control and the bleed air load valve is unsatisfactory at low temperatures. Improved turbine section durability is required. (Author)

AD-601 865 Div. 1, 2
OTS Price $13.50

Bollay (E) Associates, Inc., Goleta, Calif.
OPTIMIZATION STUDIES IN THE COMMON AVIATION WEATHER SYSTEM DATA PRESENTATION SUBSYSTEM.
Final rept.,
by D. Goodale and G. Pearson. Mar 64, 198p
Contract FA WA4403, Proj. 201 002S, Task 2
FAA RD64 59

Unclassified report

Descriptors: (*All-weather aviation, Optimization), (*Weather forecasting, Terminal flight facilities), (*Terminal flight facilities, Weather forecasting), Operations research, Meteorological parameters, Display systems, Graphics, Television display systems, Aviation personnel, Air traffic control systems, Systems engineering.

This report presents the results of several optimization studies within the presentation subsystem of the CAWS (Common aviation Weather System). Detailed plan views of the Pilot Briefing Facility, Aviation Weather Facility, and the Pilot to Forecaster Service illustrate the desired principles of sound layout as discussed for each facility. Examples of integrated combinations of these facilities which may occur within the system are also discussed and illustrated. Personnel procedures, as they are concerned with acquisition and dissemination of weather information in these facilities, have been analyzed and tabulated. The existing CAWS graphic formats were examined and further optimized to be compatible with developmental display hardware. Alpha-numeric formats have been reconfigured from the previous CAWS formats only in that the fixed-data portion of the message has been shortened slightly and several formatting operations have been further defined. Both alpha-numeric and graphic forms are proposed for use with existing communication and display equipment. (Author)

Descriptors: (*Hydraulic pressure pumps, Performance (Engineering)), (*Performance (Engineering), Hydraulic pressure pumps), Aircraft equipment, Test facilities, Test methods, Models (Simulations), Wear resistance, Failure (Mechanics), Loading (Mechanics), High-pressure valves.

An investigation into the endurance and performance capability of four Vickers AA 65560-LSC-4 hydraulic pumps subjected to a minimum of 600 hours of operation including repeated cyclic load operations with fast starts at system pressures of 2850 psig to 3100 psig and environments from -65 F to 240F fluid temperatures has been made. Pumps that failed to meet performance requirements were repaired by parts replacement and testing continued until a total of 60 prescribed test spectrums of operating events requiring 10 hours of operation each were repeated. Correlation of the measured wear rates of the various variable volume pumps was established with respect to system parameters which include: fluid environment, transient inlet pressure conditions, fluid particle contamination and dynamic loading effects produced by rapid opening and closing operating valves. Results of wear materials from the pumps were analyzed and weighed each 100 hours of operation for significant information directed to determining the mechanical serviceability of the pumps. Operating performance of the test pumps were determined each 60 hours of testing. (Author)

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

AD-602 122 Div. 1, 7
OTS Price $5.00

North American Aviation, Inc., Columbus, Ohio.
IMPROVEMENT OF WIRE TEST METHODS.
Final rept.,
by Jack L. Conrad. 27 Nov 63, rev. 10 Mar 64, 347p
na63H1108
Contract NOw61 0238d
Unclassified report

Rept. on Investigation and Survey of Aircraft Interconnecting Wire presented to symposiums held by the Bureau of Naval Weapons in 1961, 1962 and 1963.

Descriptors: (*Electric wire, Test methods), (*Test methods, Electric wire), Wire, Quality control, Specifications, Test equipment, Aircraft equipment.

An engineering investigation, survey, and test program on aircraft interconnecting wire was conducted to determine realistic and definitive quality control procedures. Specifically, the following acceptance tests were investigated: abrasion, flammability, tank dielectric, high temperature endurance, wicking, and bondability and sealing. Each of these tests was reviewed with the goal of developing an optimum test procedure.

AD-602 125 Div. 1, 25
OTS Price $1.25

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
HELICOPTER SHAFT FORCE MEASUREMENT SYSTEM.
by William R. Deazley. Apr 64, reprint Mar 64, 45p
CAL TG-1476F1
DA44 177TC700, Proj. 9R38 13 014 01
TRECOM TR61 58
Unclassified report

Descriptors: (*Drive shafts, Shear stresses), (*Helicopter rotors, Drive shafts), Tensile properties, Shafts, Tensiometers, Azimuth, Measurement, Fuselages.

The development of instrumentation to measure shaft shear and tension forces was undertaken to aid in the measurement of the rotor shaft forces on an HU-1 helicopter to be tested in the 40 foot by 80 foot wind tunnel at the NASA Ames Research Center. Since it is not possible to measure the rotor-fuselage interaction forces on the wind tunnel balances, it was necessary to measure the main rotor shaft forces. These forces are the only direct measurement of the interaction between the fuselage and rotor system. Strain gages were mounted on the rotor shaft to measure directly the strains resulting from shear and tension forces.

AD-602 173 Div. 1, 33
OTS Price $0.75

Federal Aviation Agency, Washington, D. C.
SOME CONSIDERATIONS OF SONIC BOOM.
Summary rept.,
by J. Kenneth Power. May 61, 29p
Unclassified report

Descriptors: (*Sonic boom, Theory), Jet plane noise, Lift, Volume, Shock waves, Pressure, Supersonic planes, Pressure, Atmospheric temperature, Equations, Fluid dynamic properties, Public relations, Flight testing.

Contents: Basic phenomena discussion, theoretical considerations, lifting effects, flight test--comparison with theory, general considerations of noise, sonic boom--point source explosions, prediction of effects of sonic boom overpressures, shock wave noise problems of future supersonic transport aircraft, available references on sonic boom.

AD-602 175 Div. 1, 33
OTS Price $1.25

Federal Aviation Agency, Washington, D. C.
SONIC BOOM EFFECTS ON LIGHT AIRCRAFT HELICOPTERS AND GROUND STRUCTURES.
Rept. for 3 Feb-10 Apr 64,
by Joseph Kenneth Power. Jun 64, 44p
Unclassified report

For presentation to the American Society for Testing and Materials, Chicago, Ill., June 25, 1964.

Descriptors: (*Sonic boom, Damage), Meteorological parameters, Sound, Shock waves, Pressure, Helicopters, Aircraft, Tests, Housing.

AD-602 176 Div. 1, 28
OTS Price $1.00

Federal Aviation Agency, Washington, D. C.
SONIC BOOM AND COMMUNITY RELATIONS,
by J. K. Power and George Bates Apr 64, 40p
Unclassified report

Presented at the National Aero-Nautical Meeting, Washington, D. C. April 8-11, 1963. Society of Automotive Engineers, Inc., Paper no. 683B

Descriptors: (*Sonic boom, Damage), Supersonic flight, Humans, Supersonic planes, Lift, Volume, Shock waves, Meteorological parameters, Pressure, Design, Sound, Commercial planes, Public opinion.

Some preliminary accomplishments of sonic boom research in predicting strength and location of sonic boom shock waves, determining the effects on light aircraft, and evaluating community tolerance to various levels of sonic boom intensity are reviewed. A brief summary of the implications of sonic boom with regard to supersonic transport design is included.

AD-602 221 Div. 1, 2, 14
OTS Price $5.60

Raven Industries, Inc., Sioux Falls, S. Dak.
FINAL REPORT [STUDY AND IMPROVEMENT OF BALLOON DESIGN],
by J. E. Kittelson and J. A. Winker.
10 Jun 64, 52p Raven 1764
Contract Nonr3390 10
Unclassified report

Descriptors: (*Balloons, Design), Construction, Test methods, Polyethylene plastics, Models (Simulations), Inflatable structures, Structural properties, Lift, Materials, Meteorological balloons, Flight testing.

A flaw occurred during the complicated modification procedure and was not detected. A seam ruptured just prior to the completion of inflation permitting only the observation that deployment and shape of the bubble were greatly improved. (Author)

AD-602 244 Div. 1
OTS Price $2.50

North American Aviation, Inc., Los Angeles, Calif.
CONDUCT TEST-TO-FAILURE ON HYDRAULIC PUMPS (VUCKERS AA 65560-LSC-4).
Final rept. for 21 Jun 62-21 Sep 63,
by Walter E. Yurs and Thomas E. Oppenheim.
13 Sep 63, 120p NA62 1033 3
Contract NOw62 0775d
Unclassified report

A method was devised by which short-term deviations from the astronomical tides at Monterey, California were detected and measured in the absence of the predicted tides at Monterey. This was accomplished by comparing the observed tides at Monterey with the predicted tides at San Francisco. The sea-level deviations, or anomalies, that can be found using this method range in duration from several hours to two or three days. The sea-level variations that were detected during a six-month period at Monterey had magnitudes ranging between +0.9 and -0.8 of a foot and durations ranging from 3.5 to 39.5 hours. The largest anomalies found are attributed to sea breezes that were unaccompanied by any appreciable atmospheric pressure variations. On the other hand, pressure changes accompanying frontal passages appear to be the dominant cause of other anomalies in spite of wind effects. Time lags in the response of sea level to weather phenomena were as long as three hours. (Author)

AD-601 752 Div. 2, 15
OTS Price $2.60

Brown Univ., Providence, R. I. Div. of Applied Mathematics.
STATISTICAL METHODS FOR THE EXTRAPOLATION OF METEOROLOGICAL FIELDS,
by A. M. Yaglom. 1964 29p
Contract DA36 039sc78222
TT 64 19168

Unclassified report

Trans. of mono. Vsesoyuznoe Nauchnoe Meteorologicheskoe Soveshchanie (All-Union Scientific Meteorological Conference) (no. 2). Trudy Leningrad, 1963.

Descriptors: (*Statistical processes, Weather forecasting), (*Weather forecasting, Statistical processes), Meteorological parameters, Mathematical prediction, Differential equations, Atmosphere, Dynamics, Meteorology, Reviews, USSR.

The majority of articles included in these Proceedings deals with one or another aspect of numerical methods for weather prediction, based upon the solution of an initial value problem for a certain system of differential equations describing the dynamic processes in the earth's atmosphere.

AD-601 763 Div. 2, 15
OTS Price $11.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SMALL DENOMINATORS AND PROBLEMS OF STABILITY OF MOTION IN CLASSICAL AND CELESTIAL MECHANICS,
by V. I. Arnol'd. 25 May 64, 142p
FTD MT64 175; TT 64 19166

Unclassified report

Edited machine trans. of Uspekhi Matematicheskikh Nauk (USSR) 1963, v. 18, no. 6(114) p. 91-192.

Descriptors: (*Celestial mechanics, Theorems), Planets, Perturbation theory, N-body problem, Motion, Stability, Functional analysis, Hamiltonian, Topology, Mathematical analysis, Astrophysics, USSR.

Contents: Perturbations Theory, Adiabatic Invariants, On the Stability of Planetary Motions, Fundamental Theorem, Technical Lemmas, Technique of Smoothing.

AD-601 768 Div. 2, 12
OTS Price $2.25

RAND Corp., Santa Monica, Calif.
POLLUTION OF THE UPPER AIR ATMOSPHERE BY ROCKETS.
Memo. rept.,
by W. W. Kellogg. Jun 64, 89p RM-3961PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Atmospheric pollution, Rockets), (*Upper atmosphere, Exhaust gases), Booster motors, Hydrogen, Oxygen, Carbon dioxide, Nitrogen, Waste gases, Sodium, Water, Potassium, Lithium, Spacecraft debris, Contamination, Stability, Tracer studies.

This report estimates the amounts of various constituents that would have to be continually injected by rockets into the upper atmosphere in order to double the worldwide natural concentrations there. Involved in the calculations are: (a) the natural atmospheric abundances of constituents such as H_2O, CO_2, NO, Na, K, Li, H, etc; (b) the residence times in various regions of the atmosphere, since these determine how rapidly a constituent will be removed; and (c) the chemical or photochemical stability of a substance exposed to the upper atmosphere environment. It is concluded that a doubling of the CO_2, H_2O, or NO content would require per year on the order of 1000 to 100,000 Saturn-type rockets, each injecting 100 tons of exhaust above 100 km. On the other hand, a few hundred small rockets per year, each containing 10 kg of the chemical, would probably double the Na content; similarly, less than two such rockets per year would be expected to double the Li content. These last conclusions have implications for future tracer experiments using these substances.

AD-601 770 Div. 2, 8
OTS Price $0.75

Harvard Coll., Cambridge, Mass. Observatory.
INVESTIGATION OF THE OUTER IONOSPHERE BY OBSERVATIONS OF EXTRATERRESTRIAL LOW-FREQUENCY NOISE IN SPACE VEHICLES.
Final rept.
by G. R. Huguenin. Mar 64, 29p
Contract AF19 604 6120, Proj. 8605, Task 860504
AFCRL 64 357

Unclassified report

Descriptors: (*Radio astronomy, Scientific satellites), (*Ionosphere, Electromagnetic waves), (*Satellites (Artificial), Instrumentation), Space probes, Extraterrestrial radio waves, Ionospheric propagation, Measurement, Radiometers, Astrophysics, Geophysics, Radio transmission.

The research carried out was aimed primarily at determining the electromagnetic environment of the earth for wavelengths between 20 meters and 6 kilometers. Measurements of the radio environment of the earth were conducted with rocket probes and near earth satellites at several discrete frequencies within this band. A considerable amount of theoretical research was also done; in particular, the problems of the interaction of the electromagnetic radiation with the terrestrial ionosphere were studied, and theoretical models of the source of radiation in this wavelength interval were produced. This research is of prime interest to radio astronomy and astrophysics, ionospheric physics, and MF and HF communications.

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-601 704 Div. 2
OTS Price $3.60

Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF NUMERICALLY DETERMINED DIVERGENT AND NON-DIVERGENT WINDS TO GEOSTROPHIC WINDS.
Master's thesis,
by Fred Ernst Lacey. 1964 40p

Unclassified report

Descriptors: (*Wind, Weather forecasting), (*Atmospheric motion, Weather forecasting), Velocity, Temperature, Programming (Computers), Meteorological charts, Equations, Numerical analysis, Meteorology.

Numerical weather analysis relies heavily on numerically computed winds both for direct output and internally for calculating advection and other purposes. It is the intent of this paper to compute, analyze, and compare the geostrophic, the non-divergent, the divergent, and a combination of the latter two. Where there occurs a significant difference between these numerically derived winds, an attempt is made to compare each to the observed winds. This study is made for all standard levels through 300 mb. Data and several computer programs were furnished by the U. S. Navy Fleet Numerical Weather Facility, Monterey, California. (Author)

AD-601 707 Div. 2, 25
OTS Price $0.50

Army Electronics Research and Development Activity, White Sands Missile Range, N. Mex.
A PROPOSED X-RAY-INFRARED METHOD FOR IDENTIFICATION OF ATMOSPHERIC MINERAL DUST.
by Teddy L. Barber. Jun 64, 20p
ERDA 141

Unclassified report

Descriptors: (*Dust, Atmosphere), (*X-ray diffraction analysis, Dust), (*Infrared spectroscopy, Dust), Identification, Minerals, Particles, Collecting methods, Copper, Chromium, Absorption spectrum, Crystallography.

An experimental technique is presented for the identification of the major mineral constituents in small samples of atmospheric particulates. Each sample is divided into two parts; one is examined by x-ray powder diffraction at two wavelengths, copper and chromium K alpha, and the other is examined by infrared absorption. With this combination it has been possible to extend component crystalline mineral identification down to 1 mg of total sample. (Author)

AD-601 724 Div. 2, 1
OTS Price $1.00

Air Vehicle Environmental Research Team, Natick, Mass.
A PRELIMINARY MODEL OF MOST-SEVERE [illegible] FLYING CONDITIONS.
Research study rept.,
by Walter F. Wood, Philip G. Soderberg and Richard J. Pike.
Jun 62, 39p
Proj. 9R95 20 001 02
AVERT AE4

Unclassified report

Descriptors: (*Terrain models, Aeronautics), (*Terrain, Map reading), (*Terrain avoidance, Models (Simulations)), Flight paths, Mapping, Hazards.

The report describes an empirical method by which the densities of contours, ridges, and valleys on a topographic map may be made to yield data on the dimensions of the terrain features likely to offer the most difficulty to low-level flight. (Author)

AD-601 727 Div. 2
OTS Price $2.60

Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF THE INFLUENCES OF INTERNAL WAVES OF TIDAL PERIOD UPON THE MIXED-LAYER DEPTH.
Master's thesis,
by Harold R. Lambright. 1964, 30p

Unclassified report

Descriptors: (*Tides, Sources), (*Ocean waves, Sources), Marine geophysics, Oceans, Thermal properties, Oscillation, Energy, Density, Dynamics, Oceanology.

The apparently random oscillation of the mixed-layer depth is investigated and, by the nature of its energy spectrum and its correlation with tidal activity, a determination of the source of some components of this oscillation is made. Actual and smoothed values of the mixed-layer depth at ocean station P in the Gulf of Alaska are subjected to spectral analysis for the presence of suspected tidal periodicities. To locate the source of the tidal influences, correlations between tidal activity on the shelf and a measure of the magnitude of the oscillation of the mixed layer at P are found for various lags. The amplitudes of the oscillations observed at the ocean station are compared to those calculated from a model proposed by Rattray. The spectrum analysis shows large energy peaks at tidal periodicities. The close agreement, especially in the winter season, between the lag for large correlation of the tidal activity at the shelf with the mixed-layer depth oscillation at P and calculated travel times of the internal tide from the shelf to P suggest that the generation of the internal tide is at the continental shelf. (Author)

AD-601 745 Div. 2, 15
OTS Price $3.60

Brown Univ., Providence, R. I. Div. of Applied Mathematics.
ON THE ANALYSIS AND PREDICTION OF METEOROLOGICAL FIELDS.
Technical rept. no. 2,
by Walter Freiberger. Apr 64, 32p
Contract DA36 039AMC87222

Unclassified report

Descriptors: (*Weather forecasting, Mathematical prediction), Meteorological parameters, Stochastic processes, Statistical processes, Mathematical models, Meteorology.

An attempt is made to describe the weather in terms of stochastic processes and related concepts. Some of the possible descriptive statistical techniques applicable to meteorological forecasting are surveyed. Examples of the formulation of stochastic models are presented. Finally, the problem of predicting random fields from incomplete information is discussed.

AD-601 746 Div. 2
OTS Price $6.60

Naval Postgraduate School, Monterey, Calif.
SHORT-TERM SEA-LEVEL ANOMALIES AT MONTEREY, CALIFORNIA.
Master's thesis
by Paul O'Connor. 1964, 64p

Unclassified report

Descriptors: (*Tides, Depth finding), Marine geophysics, Marine meteorology, Astrophysics, Sea breeze, Barometric pressure, Oscillation, Measurement, California, Oceanology, Graphics.

are also included. The theory and design criterion of a 30 watt pulse modulated transmitter using ceramic planar triode tubes with coaxial resonators is also presented. The final section suggests the development of a transistorized, frequency modulated transmitter operating at 400 mc. A simple method of obtaining the frequency modulation is developed along with suggested circuits and their power gains for the remaining sections of the transmitter. The power output is conservatively estimated at 825 mw. (Author)

AD-601 824 Div. 2, 30
OTS Price $1.75

American Bosch Arma Corp., Garden City, N. Y.
ON A STUDY OF SPECIFIC METHODS OF MEASURING LUNAR GRAVITY.
Final rept.
by Harold Levenstein, Paul H. Savet, Murray J. Stateman and Frank Wessbecher. Apr 64, 66p Arma DS64R531 35
Contract AF19 628 3855, Proj. 7600, Task 760007
AFCRL 64 363

Unclassified report

Descriptors: (*Moon, Gravity), (*Gravity, Moon), Geophysics, Potential theory, Geodesics, Isostatic change, Measurement, Scientific staellites, Instrumentation, Magnetometers, Design.

The measurement of the gravity field of the moon from an orbiting satellite is examined from the points of view of requirements for geodetic and geophysical application, and physical phenomena and instrumentation to meet these requirements. It is shown that it is feasible to determine the gravity field by measuring the gravity gradient. Mathematical relations useful for data processing are stated. Examination of several principles for sensing gravity gradient leads to the recommendation of the vibrating string gradiometer as the best implementation with size, accuracy, range and versatility being in its favor. In addition the engineering status allows prototype design to begin immediately. (Author)

AD-601 846 Div. 2, 30, 32
OTS Price $3.50

Aerospace Information Div., Washington, D. C.
SKY ILLUMINATION PHENOMENA: ANNOTATED BIBLIOGRAPHY (1957-JUN 63).
Rept. no. 1.
24 Jun 64, 205p
AID B64 42; TT 64 11812

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature.

Descriptors: (*Sky brightness, Bibliographies), (*Bibliographies, Sky brightness), Aurorae, Noctilucent clouds, Zodiacal light, Twilight, Optical phenomena, Atmosphere, Measurement, Instrumentation, Meteorological phenomena.

An annotated literature survey of Soviet-bloc research for the period 1957 to June 1963 on (1) combined auroral and airglow reviews, (2) airglow (day, night, twilight), (3) auroras (spectra and excitation mechanisms), (4) noctilucent clouds, (5) zodiacal light, (6) gegenschein, (7) twilight, and (8) instrumentation is presented. Entries are arranged alphabetically by author within each of the major subject groups. Library of Congress call numbers are included at the end of an entry when the item is cataloged and available in the collections of the Library of Congress. Where the original source is not available, a secondary source is indicated. An Introduction, describing the main developments of Soviet research during the period 1957-1963, precedes the bibliographic entries. An Author Index is included.

AD-601 864 Div. 2, 12
OTS Price $1.25

Stanford Research Inst., Menlo Park, Calif.
VARIATIONS OF SATELLITE DAYTIME RADIATION DATA WITH VIEWING GEOMETRY.
Scientific rept. no. 3,
by W. Viezee, R. L. Mancuso, and P. A. Davis. Jun 64, 43p
Contract AF19 628 2777, Projs. 6698 and 4448, Task 669803

Unclassified report

Descriptors: (*Meteorological satellites, Radiation measurement systems), (*Radiation measurement systems, Meteorological satellites), (*Cloud cover, Albedo (Astronomy)), Clouds, Photographic analysis, Solar radiation, Temperature, Sky, Infrared windows, Scanning, Scattering, Radiometers.

Data obtained from the solar-reflectance channels of TIROS III are examined for a region which was scanned twice within a few minutes as a result of a change in the scanning mode of the radiometer. The data analyses indicate that signals received for scattering angles of 60 to 70 degrees are significantly stronger than those for the angles of 130 to 160 degrees. The difference between albedos for these two ranges of scattering angle was largest for an area of relatively clear skies. The variation of albedo with the scattering angle was more pronounced for the broad solar channel than for the visible channel. Potential limb effects for partly cloudy sky are estimated in terms of cloudiness, effective temperature, and albedo. Atmospheric effects are neglected. It is shown that effective temperatures from an ideal infrared window could decrease by more than 5 degrees Kelvin, while the albedos from a solar-reflectance channel increase by more than 10 percent for a typical increase (40 degrees) in the radiometric nadir angle of a scan pattern. (Author)

AD-601 885 Div. 2, 4
OTS Price $2.50

Washington Univ., Seattle.
AN ANALYSIS OF CARBON DIOXIDE IN THE ARCTIC ATMOSPHERE AT POINT BARROW, ALASKA.
Technical rept. for 1961-1963,
by John J. Kelly, Jr. May 64, 101p
Contract Nonr477 24, Proj. NR307 252

Unclassified report

Descriptors: (*Carbon dioxide, Atmosphere), (*Atmosphere, Carbon dioxide), Gases, Alaska, Diurnal variations, Measurement, Collecting methods, Gas analysis, Infrared spectroscopy, Data, Tables.

The results of measurements of carbon dioxide in air at Point Barrow, Alaska, and the principle of operation of the infrared gas analyzer are described. Reference gas comparison data are given in tables, and the method of calculations discussed. The average daily concentrations of atmospheric carbon dioxide are tabulated for the period 10 July 1961 to 20 February 1963. The diurnal variations of carbon dioxide during this period are also presented. Results of the analyses of carbon dioxide in air collected in flasks from several other Alaskan locations are given. (Author)

AD-601 890 Div. 2, 30, 32
OTS Price $1.00

Aerospace Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE: COMPILATION OF ABSTRACTS FROM SOVIET LITERATURE.
Rept. no. 47 reviewing Soviet Developments in Selected Problems in Astrophysics and Geophysics.
25 Jun 64, 37p
AID P64 43; TT 64 11811

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature.

Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-601 771 Div. 2, 30
OTS Price $0.50

Travelers Research Center Inc., Hartford, Conn.
WEATHER DATA PROCESSING RESEARCH AND DEVELOPMENT PROGRAM.
Monthly progress rept. for May 64
by C. F. Jenkins. May 64, 19p
Contract Cwb10704

Unclassified report

Descriptors: (*Weather forecasting, Data processing systems), (*Programming (Computers), Weather forecasting), Statistical analysis, Probability, Algebras, Mathematical prediction, Ceiling, Visibility, Wind, Barometric pressure, Data, Rainfall, Meteorological parameters, Climatology.

MDA (multiple discriminant analysis) was found useful in predicting the probability of operationally critical airfield ceiling and visibility conditions. One part of the discriminant procedure requires at the outset a rather lengthy computation by machine to estimate these probabilities. While the operational use of the method takes much less effort, the time needed initially on a large scale computer may be inordinate when many elements, time periods, and geographical locations are being considered. The technical report discusses a prediction technique., REEP (regression estimation of event probabilities), which resulted from attempts to make MDA more efficient. Comparative studies between REEP and MDA are included as well as other experimentations performed using the REEP procedure. Recommendations for future work on the technique are also given. (Author)

AD-601 774 Div. 2
OTS Price $7.60

Naval Postgraduate School, Monterey, Calif.
A STUDY OF CURRENTS IN SOUTHERN MONTEREY BAY.
Master's thesis,
by Connelly D. Stevenson. 1964, 75p

Unclassified report

Descriptors: (*Ocean currents, Measurement), Beaches, California, Water, Motion, Towed bodies, Tracking, Trajectories, Plotters, Digital computers, Marine meteorology, Hydrographic surveying, Oceanology.

Measurements of surface and subsurface water circulation in shallow water in the extreme southern end of Monterey Bay were made by tracking drogues from the beach. A computer program included in the appendix was developed to transform the raw survey data into drogue courses and speeds, and to plot their trajectories. Analysis of the drogue tracks showed a predominance of shoreward flow. Interpretation of the effect of wind and sea conditions upon the observed water transport revealed a close dependence upon winds above five knots, in contrast to an apparent lack of dependence upon tidal variations and waves. Water motions in general responded to changes in the character of the wind with very little time lag, the lag increasing slightly with depth. Water flow commonly diminished and was deflected an increasing amount to the right of the wind with depth, presumably in response to Coriolis effect. (Author)

AD-601 775 Div. 2, 25
OTS Price $9.10

Naval Postgraduate School, Monterey, Calif.
CHARACTERISTIC SOUND-VELOCITY PROFILES IN THE SUB-ARCTIC PACIFIC OCEAN.
Master's thesis,
by Allan G. Brookes, Jr. 1964, 109p

Unclassified report

Descriptors: (*Pacific Ocean, Arctic regions), (*Acoustics, Marine geophysics), Sound, Velocity, Configuration, Temperature, Salinity, Oceanographic data, Reduction, Digital computers, Ocean currents, Mapping, Oceanology.

Temperature and salinity data from the Subarctic Pacific (north of 40N) and adjacent regions were reduced to sound-velocity profiles by means of digital computer and mechanical plotter techniques. Characteristic profiles from the surface to 1000 meters were identified in the Kuroshio and Oyashio Current regions and four of the five domains within the Subarctic region. A gross measure of the variation of velocity within each area was obtained by drawing an envelope into which could be fitted all the sample profiles for that area. Finally, some basic acoustic implications of the sound-velocity profiles were considered. It is suggested that this method of summarizing sound-velocity data may have a useful application in military oceanography, in that it is a relatively simple way of deriving and displaying the macroscale features of the sound-velocity distribution in the ocean. (Author)

AD-601 776 Div. 2
OTS Price $6.60

Naval Postgraduate School, Monterey, Calif.
OBSERVATIONS OF THE NEARSHORE WATER CIRCULATION OFF A SAND BEACH.
Master's thesis,
by John F. Brennan and Richard P. Meaux. 1964, 67p

Unclassified report

Descriptors: (*Ocean currents, Measurement), Sand, Beaches, California, Water, Motion, Velocity, Floats, Aerial photographs, Trajectories, Marine meteorology, Hydrographic surveying, Oceanology.

The nearshore circulation off a long sand beach at the southern end of Monterey Bay, California, was studied during February and March 1964. The circulation patterns found are presented in the form of schematic charts for each of the five surveys made. The dominant drift was observed to be directly onshore in the area seaward of the surf zone, but inside the surf zone the flow was to the north. Weak circulation cells were found to exist in the surf zone at varying locations along the beach. Current speeds are presented for the onshore drift, the dominant longshore current, the opposing feeder currents to rips, and the rip currents. The speed of the onshore drift was found to be greater than that of the opposing rip currents. (Author)

AD-601 818 Div. 2, 8, 30,
OTS Price $2.00

Upper Air Research Lab., Univ. of Utah, Salt Lake City.
PROGRESSIVE DEVELOPMENTS IN THE DESIGN OF AN AIRBORNE UHF TRANSMITTER FOR THE FALLING SPHERE EXPERIMENT.
Technical rept. no. 1,
by Jon L. Cross. 9 Dec 63, 80p
Contract AF19 604 6658, Proj. 6690, Task 669001
AFCRL 63 922

Unclassified report

Descriptors: (*Telemetering transmitters, Ultrahigh frequency), (*Sounding rockets, Telemetering transmitters), (*Atmospheric sounding, Density), Meteorological instruments, Airborne, Pulse transmitters, Electromagnetic pulses, Transformers (Electronic), Accelerometers, Slot antennas, Triodes, Cavity resonators, Transistors, Frequency modulation, Oscillators, Amplifiers, Spheres.

In this report the development of a pulsed telemetry transmitter to be incorporated into a 7 inch sphere containing instrumentation to measure high altitude air density is discussed. A 20 watt, 730 mc tube type pulse transmitter is described. Construction details and checkout procedure

cosmic ray intensity were made for a period of several years and were correlated with cosmic ray increases that occurred during solar flares. Numerous studies were made of the solar particle radiation at high altitudes through balloon flights.

AD-601 940 Div. 2, 1
OTS Price $12.00

Bollay (E) Associates, Inc., Goleta, Calif.
AVIATION FORECAST QUALITY CONTROL.
Final rept.,
by B. Culbertson. Feb 64, 163p
Contract FA WA4403, Proj. 201 002S, Task 1B
FAA RD64 65

Unclassified report

Descriptors: (*Weather forecasting, Aeronautics), (*Quality Control, Weather forecasting), Airports, Aircraft, Metorological parameters, Wind, Ceiling, Visibility, Records, Tables, Data.

The study was directed toward the development of a quality control system which the FAA might use to monitor the quality of the U. S. Weather Bureau's aviation forecasts - terminal (FT's), winds aloft (FD's), and area (FA's). The evaluation was designed to determine forecast operational goodness regardless of specific weather or forecast methods. The results of the study serve to: (1) provide the means of checking the quality of non-Agency weather forecasts which are used by Agency represented aviation; (2) provide guidance to forecast users as to forecast operational goodness; (3) suggest primary areas needing service improvement. The report shows that FT's and FD's, because of their direct and limiting format, are amenable to quality control techniques and procedures, while FA's are not, due to the flexibility of organization and freedom of expression permitted therein. The reports suggests that: (1) the route concept should replace the area concept for both quality control and operational purposes; (2) the organization of the FA should be standardized.

AD-601 944 Div. 2, 30
OTS Price $0.75

Air Force Proving Ground Command, Eglin AFB, Fla.
LOW-LEVEL, FINE-SCALE WIND DETERMINATION BY CAPTIVE BALLOONS,
by William O. Banks. May 64, 26p
Proj. 2525W3
APGC TDR64 24

Unclassified report

Descriptors: (*Wind-direction indicators, Meteorological balloons), (*Meteorological balloons, Wind-direction indicators), Wind, Measurement, Balloons, Anemometers, Towers, Correlation techniques, Test facilities, Micrometeorology.

A flexible, inexpensive micrometeorological network using captive balloons is described. Captive balloon anemometry is compared to pibal and tower methods of measuring winds aloft. Correlation coefficients are computed between measurements made using four captive balloons and a 50-ft tower. (Author)

AD-601 997 Div. 2, 1, 14
OTS Price $3.00

Kaysam Corp. of America, Paterson, N. J.
STUDY OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF BALLOONS AND BALLOON MATERIALS.
Final rept. for 1 Mar 63-29 Feb 64
by Eric Nelson and Herman Newstein. 29 Feb 64, 157p
Contract DA36 039AMC02160E, Proj. 1AO 25001A 126 04 04

Unclassified report

Descriptors: (*Meteorological balloons, Performance (Engineering)), Ozone, Environmental tests, Synthetic rubber, Polymers, Plasticizers, Antioxidants, Binders, Isocyanate plastics, Processing, Tensile properties, Elasticity, Molecular structure, Balloons, Flight testing, Rupture, Degradation, Elastomers, Stresses.

A study was made to improve the performance of meteorological balloons by the use of newly developed neoprene polymers specifically designed for such a purpose, by the use of other basic polymeric materials, by improved compounding and processing, and by a better understanding of atmospheric conditions during flight. (Author)

AD-602 004 Div. 2, 25
OTS Price $0.50

California Univ., Los Angeles.
OPTICAL STUDIES OF THE ATMOSPHERE.
Final rept., for 1 Mar 61-29 Feb 64.
by Zdenek Sekera. Apr 64, 14p
Contract AF19604 8050 Proj. 7621, Task 762103
AFCRL 64 366

Unclassified report

Descriptors: (*Atmosphere, Optical analysis), Sky brightness, Light, Electromagnetic waves, Scattering, Absorption, Intensity, Polarization, Diffusion, Optical instruments, Theory, Experimental data, Optics.

A balanced program of experimental and theoretical investigations of the problems encountered in atmospheric optics was pursued. Formal solutions for the problem of radiant energy transfer in a physically realistic medium exhibiting both scattering and true absorption were obtained. New instruments to be used in the study of intensity and polarization of diffuse skylight were designed and fabricated. Investigation of the effect of a turbid layer on the radiation emerging from a planetary atmosphere was completed for an idealized case. (Author)

AD-602 007 Div. 2, 20
OTS Price $2.75

RAND Corp., Santa Monica, Calif.
TABLES OF COLUMNAR AIR MASS BETWEEN TWO POINTS IN THE ATMOSPHERE AND IONIZATION PRODUCTION RATES DUE TO DEBRIS-DECAY GAMMA-RAYS,
by E. C. Field, M. Lakatos and P. Tamarkin. Jun 64, 125p RM-4142

Unclassified report

Descriptors: (*Air mass analysis, Tables), (*Radioactive decay, Gamma emission), (*Radiological contamination, Atmosphere), Nuclear explosions, Air burst, Fission products, Ionization.

Tables of the mass of air contained in a column of atmosphere of 1 sq cm cross-section and extending between many pairs of points in the terrestial atmosphere are presented. Such a tabulation is useful, for example, in the study of atmospheric effects due to various types of radiation from nuclear bursts. Extensive tables of ionization production rates at various locations due to gamma-rays from restricted regions of decaying fission debris are also given. A variety of source-field point geometries, corresponding to those in the air mass tables, are used, and three gamma-ray energies are considered. (Author)

Descriptors: (*Upper atmosphere, Abstracts), (*Abstracts, Upper atmosphere) Ionosphere, Electron density, Solar radiation, Van Allen radiation belt, Cosmic rays, Atmospheric electricity, Nuclear explosions, Scientific satellites, Meteorology, Astrophysics, Geophysics.

Reports reviewing Soviet developments in selected problems in astrophysics and geophysics are presented. Topics covered are as follows: Ionospheric electron concentrations, solar radiation and the ionosphere, Van Allen belts and cosmic rays, telluric currents, atmospheric electricity, nuclear bursts in the atmosphere, satellite and missile data, and, meteorology of the upper atmosphere.

AD-601 901 Div. 2, 8
OTS Price $0.50

RAND Corp., Santa Monica, Calif.
ELECTROMAGNETIC EFFECTS ASSOCIATED WITH THE SAN FRANCISCO FIREBALL OF NOVEMBER 7, 1963,
by Donald L. Lamar and Mary F. Romig. Jun 64, 14p
P 2924

Unclassified report

Descriptors: (*Meteros, Electromagnetism), (*Electromagnetic waves, Meteors), (*Radio interference, Meteors), Sound, Power equipment, Malfunctions, Radio stations, Physical properties, Public opinion, Reports, California.

Interviews were conducted with individuals in the San Francisco area who had observed the fireball and who were familiar with the reported electromagnetic effects. An appeal for information from individuals who had seen the fireball was made through the newspapers in the San Francisco area. Data on the nature of the fireball and the reliability of the reports of associated electromagnetic disturbances are summarized.

AD-601 904 Div. 2
OTS Price $6.60

Boeing Co., Seattle, Wash.
THE LUNAR SURFACE.
by J. H. Lincoln. 5 Nov 62, 67p, D2 100036

Unclassified report

Descriptors: (*Moon, Surface properties), (*Lunar environment, Terrain), (*Extraterrestrial topography), (*Astrophysics), Lunar satellites, Astronomical data, Lunar probes, Telescopes, Visual inspection, Photographic analysis, Terrain models, Extraterrestrial radio waves, Albedo (Astronomy), Luminescence, Thermal properties, Surface temperatures, Reflection, Refraction, Water, Bibliographies.

The lunar observational techniques and their limitations and some current concepts relating to the surface of the moon are described in order to provide some insight to the current state of knowledge. Recent books, papers, charts and publications in the open technical literature through August 1962 were the principal sources of information. For a review of studies related to this subject, a selection of applicable document references is included. (Author)

AD-601 905 Div. 2, 12
OTS Price $0.50

Hawaii Inst.of Geophysics, Honolulu.
THE UTILIZATION OF TIROS PICTURES TO SOME SELECTED STUDIES OF TROPICAL METEOROLOGY.
Final rept.,
by Ronald C. Taylor. Apr 64, 18p, HIG 64 5
Contract AF19 604 6156, Proj. 6698, Task 669802
AFCRL 64 327

Unclassified report

Descriptors: (*Cyclones, Meteorological satillites), (*Meteorological satillites, Photographs), Malaya, Precipitation, Diurnal variations, Sea breeze, Terrain, Climate, Indian Ocean, Pacific Ocean, Wind, Sea water, Weather stations, Hurricanes, Storms, Clounds, Jet streams (Meteorology), Tropical regions, Meteorological ballons.

Contents:
The subtropical cyclone;
Cloud patterns in a tropical cyclone in the Arabian Sea viewed by Tiros I meteorological satellite;
Diurnal variation of summer rainfall over Malaya;
Tropical cyclones of the Eastern North Pacific as revealed by Tiros observations;
Tiros observations of the summer circulation and weather patterns of the Eastern North Pacific.

AD-601 936 Div. 2, 16
OTS Price $0.50

[Scripps Institution of Oceanography, Univ. of California, La Jolla.]
THE CAUSES AND MECHANISMS OF DIURNAL VERTICAL MIGRATION IN THE SEA.
Final rept.
16 Oct 63, 6p
Contract Nonr233 31

Unclassified report

Descriptors: (*Marine biology, Crustacea), Biophysics, Biochemistry, Photoperiodism, Photosensitivity, Eye, Plankton, Light, Oceans, Distribution, Diurnal variations, Marine geophysics, Oceanology.

The close relationship throughout the diurnal cycle between the vertical position of the main sonic-scattering layer in the San Diego region and a particular level of submarine irradiance was demonstrated. Plankton collections made at such depths revealed that the euphausiid crustaceans were preeminently important constituents of the scattering layer population in this region. Biochemical analysis of the photosensitive pigments in the eyes of these midwater crustaceans presented a close relationship between the absorption spectra of the pigments and the spectral distribution of the light at the depths the animals inhabit. Their spectral sensitivity was measured by electrophysiological experiments, and was shown to be similarly related to environmental light.

AD-601 938 Div. 2, 20
OTS Price $0.50

California Univ., Berkeley.
[COSMIC RAY GROUP].
Final rept. for 15 Dec 54-30 Jun 63,
by W. B. Fretter, R. R. Brown, and K. A. Anderson.
26 Jun 64, 9p
Contract Nonr222 40, Proj. NR021007

Unclassified report

Descriptors: (*Cosmic rays, Scientific research), (*Nuclear physics, Elementary particles), Mesons, K-mesons, Hyperons, Cloud chambers, Bubble chambers, Nuclear reactions, Astrophysics, Solar flares, Neutrons, Protons, X-rays, Aurorae, Radiation measurement systems, Measurement.

The work is divided into two general categories: research in high energy particle physics and research on cosmic rays and solar particle emissions. High energy physics was concerned with the observation of various particles produced in high-energy nuclear interactions, first using cosmic rays as the source of such particles and more recently using the accelerator at CERN, Geneva. The research on cosmic rays was concerned with temporal and spatial variations of cosmic rays studied by means of neutron monitors located at Berkeley and a neutron monitor which voyaged between San Francisco and Australia. Routine observations of neutron

AD-602 078 Div. 2
OTS Price $6.00

Air Force Cambridge Research Labs., Bedford, Mass.
PROJECT FIREFLY 1962-1963.
Environmental research papers,
ed. by N. W. Rosenberg. May 64. 435p
AFCRL 64 364, AFCRL ERP15

Unclassified report

Descriptors: (*Upper atmosphere, Analysis), (*Wind, Ionosphere), Atmospheric motion, Explosive materials, Rocket research, Photography, Luminescence, Ionization, Payload, Explosions, High altitude.

A compilation of papers is presented reporting the preparation, observations, data reduction and interpretation of upper atmosphere experiments. The general objective of these experiments is a study of the dynamics, transport processes, state, and composition of natural and artificial perturbations of the upper atmosphere. For these studies, techniques are employed wherein various chemicals are released in the upper atmosphere from rocket-borne containers, followed by observations from the ground of the effects resulting from the release. (Author)

AD-602 082 Div. 2
OTS Price $2.25

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
JET STREAMS OVER THE USSR.
by Nina A. Stepanova. 25 Mar 64, 81p
AMC-RA RR-TR64 2

Unclassified report

Descriptors: (*Jet streams (Meteorology), USSR), Climatology, Air mass analysis, Tropopause, Wind, Turbulence, Atmospheric temperature, Lapse rate, Atmospheric motion, Radiosondes, Mapping, Intensity, Diffusion, Troposphere, Cyclones, Tables, Kinetic theory.

Climatological analysis of the distribution of jet streams over the USSR was based on a summarization and averaging of data on individual jet streams collected over a period. Russian investigations of jet streams were based mostly on observational data obtained during the 1950's. A comprehensive study of trophospheric jet streams observed over European Russia and West Siberia was made by IU. V. Kurilova and based on radiosonde data for 1950-1954. The method of composite charts was used to analyze the very changeable positions of jet streams over Russia. These charts show the axis of Upper Frontal Zones for each month. The investigation of such composite charts for 60 months resulted in a definition and outlining of those areas where the Upper Frontal Zone, and, consequently, the jet streams were most frequently observed.

AD-602 107 Div. 2, 30
OTS Price$2.25

Meteorology International, Inc., Monterey,Calif.
A TEST OF THE DIAGNOSTIC-CYCLE ROUTINE.
Final rept.
by Manfred M. Holl, James R. Clark, and Roland E. Nagle.
1 May 64, 89p
Contract Cwb10561, Proj. M110

Unclassified report

Descriptors: (*Compilers, Meteorological parameters), Meteorological satellites, Telemetering data, Cloud cover, Atmospheric motion, Air mass analysis, Weather forecasting, Correlation techniques, Programming (Computers), Meteorology.

The Diagnostic-Cycle Routine is an assembly of techniques which has been designed for the assimilation, intercomparison, and interpretation of meteorological observations of interrelated distributions, including satellite videographs. The report describes a test of the Routine as applied to a space-time region which is well documented by satellite videographs and other data. The cloudiness distributions are analysed, primarily by assembly of the available videographs, for three map-times defining two twenty-four hour periods. The evolution of the required mass-structure parameters is developed for a selected isentropic surface; and the Routine diagnoses the horizontal-velocity evolution and the three-dimensional net displacement of the layer of parcels for each of the two twenty-four hour periods. The observed changes in the cloudiness are interpreted in terms of the diagnosed air-displacements.

AD-602 117 Div. 2, 24, 30
OTS Price $3.00

Space Systems Lab., Inc., Melbourne, Fla.
REAL TIME AND DAYLIGHT GEODETIC STELLAR CAMERAS STUDY.
Final rept.
by H. T. Kohn. 6 Mar 64, 179p
Contract AF19 628 2990, Proj. 7600, Task 760006
AFCRL 64 172

Unclassified report

Descriptors: (*Ballistic cameras, Astronomical geodesics), (*Astronomical geodesics, Ballistic cameras), Geodesics, Cameras, Optical equipment, Satellites (Artificial), Position finding, Stars, Real time, Data processing systems, Sky brightness, Radiation measurement systems, Timining devices, Photogrammetry, Experimental data.

An investigation is made of observation instruments which can be used as real time and daylight geodetic stellar cameras. A fixed mount, non-image forming, externally scanning, automatic readout (FNOA) system is found to have the highest figure of merit. Characteristics of general significance are discussed in detail with emphasis on detectors exposed to ambient daylight radiation. Real time data readout is attained by coupling the photoelectric detectors with a timing system. Planes of sight are used instead of lines of sight to derive the image informations. The FNOA system is outlined in its basic concept, and a description is given of the data reduction method. Finally, the expected triangulation accuracies are derived. They are in the order or 1 sec of arc at night and of 2 sec of arc at day for zenith distances of approximately 70 degrees. The limiting factor in the readout accuracy is the shimmer effect generated by atmospheric turbulence. (Author)

AD-602 127 Div. 2
OTS Price $0.50

Emmanuel College, Boston, Mass. Research Language Center.
A METHOD FOR DETERMINING THE ELECTRON DENSITY PROFILE IN THE D-REGION OF THE IONOSPHERE.
by K. Serafimov and G. Nestorov. Mar 64, 14p
E-T-R-64-24
Contract AF19(604)8505
TT 64 11818

Unclassified report

Metod Opredeleniya Profilia Elektronnoi Plotnosti v Oblasti D Ionosfery, trans, of Geomagnetizm i Aeronomiya (USSR) 1963, v. 3, no. 6, p. 1059-1064.

Descriptors: (*Electron density, Ionosphere), (*Ionosphere, Electron density), Determination, Numerical methods and procedures, Integral equations, Taylor's series, Electromagnetic waves, Absorption, Propagation, Atmosphere, USSR.

Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-602 009 Div. 2, 30
OTS Price $2.25

Texas A. and M. Univ., College Station.
RESEARCH ON TROPICAL RAINFALL PATTERNS AND ASSOCIATED MESO-SCALE SYSTEMS.
Quarterly progress rept. no. 5, 1 Jan-30 Apr 64,
by John F. Griffiths, Walter K. Henry, and Lester A. Martin.
15 May 64, 97p TAMU Ref 64 15T
Contract DA IAO11001B021 09, Proj. 311

Unclassified report

Descriptors: (*Rainfall, Central America), Atmospheric precipitation, Distribution, Tropical regions, Statistical analysis, Curve fitting, Graphics, Meteorology, Climatology.

More data have been analyzed for the normality of distribution and work has now begun on the presentation of results in map form. The onset and end of the rainy season has been investigated for a number of stations, the preliminary results show pronounced variations over small distances. The Contingency Table is used as a method to identify the areas and seasons which the meso-scale systems are the primary cause of the rainfall. This method enables areas of less data to be classified into meso-scale or macro-scale activity. A curve relating cumulative percent amount rainfall and cumulative percent frequency has been derived and shown to be of practical importance. (Author)

AD-602 016 Div. 2
OTS Price $0.50

Naval Applied Science Lab., Brooklyn, N. Y.
A SHIPBOARD ICING OBSERVATIONS QUESTIONNAIRE FOR GATHERING AND CORRELATING SHIPBOARD ICE FORMATION AND WEATHER INFORMATION.
Technical memo. no. 1
[8 Jul 64] 11p
Proj. SF013 99 02, Task 0537
NASL 9300 20

Unclassified report

Descriptors: (*Ice formation idicators, Shipborne), (*Meteorological parameters, Ice), Ships, Research program administration, Weather forecasting, Geography, Arctic Ocean, Data processing systems.

This memorandum reports on the development of a Shipboard Icing Observations Questionnaire designed to be used for gathering data on the formation of ice aboard ship. It is intended that copies of this Questionnaire will be distributed to selected fleet units, completed by shipboard personnel and forwarded to the National Weather Record Center at Asheville, North Carolina, for processing together with coincident weather data for which reporting and processing procedures are well established. The promulgation of this Questionnaire, and the study of resulting shipboard ice-formation data constitutes one of two phases of this Laboratory's approach to Ice formation Studies. The second phase, to be pursued concurrently with the first, constitutes a laboratory investigation of ice formation conducted under various rigidly-controlled conditions of temperature, wind velocity and precipitation rate. Taken as a whole, these studies will provide the basis for compiling Geographical Icing Prediction Charts. (Author)

AD-602 017 Div. 2
OTS Price $2.25

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
OPTICAL MEASUREMENTS OF NATURAL AURORA IN THE NORTHERN AURORAL ZONE FROM AN AIRCRAFT PLATFORM.
by W. P. Boquist, W. N. Hall, and H. E. Underwood.
31 Oct 63, 92p EGG B2651
Contract DA49 146XZ092
DASA 1458

Unclassified report

Descriptors: (*Aurorae, Measurement), Meteorological phenomena, Photographic analysis, Spectroscopy, Flying platforms, Satellites (Artificial), Polar regions, Photographic film, Photographic emulsions, Instrumentation.

An auroral measurements program to study natural auroras by photographic and spectroscopic techniques was carried out. This program was performed aboard an Air Force KC-135 aircraft over Alaska. The flight missions were scheduled to coincide with the passage, overhead, of an instrumented satellite, designed to transmit radio frequency signals through the auroras in order to study the transmission properties of the auroras. When the attempt to launch the satellite failed, the radio signals transmitted by a satellite already in orbit were used. In general, results of photographic measurements were similar to those expected from typical strong auroras present at that time of year. The photographic data collected during six flight missions show structural variations of the aurora and also show that the auroral phenomena varied significantly from mission to mission. The results of the spectrographic measurements indicate the presence of most of the bands and lines generally observed in nighttime aurora. (Author)

AD-602 037 Div. 2, 15, 33
OTS Price $3.00

Travelers Research Center, Inc., Hartford, Conn.
REGRESSION ESTIMATION OF EVENT PROBABILITIES.
Technical rept. no. 1
by Robert G. Miller. Apr 64, 157p TRC 7411 121
Contract Cwb10704

Unclassified report

Descriptors: (*Weather forecasting, Statistical analysis), (*Statistical analysis, Meteorological parameters), Ceiling, Visibility, Landing fields, Aviation safety, Mathematical prediction, Probability, Algebras, Airports, New Jersey, All-weather aviation.

MDA (multiple discriminant analysis) has been found useful in predicting the probability of operationally critical airfield ceiling and visibility conditions. One part of the discriminant procedure requires at the outset a rather lengthy computation by machine to estimate these probabilities. While the operational use of the method takes much less effort, the time needed initially on a large scale computer may be inordinate when many elements, time periods, and geographical locations are being considered. This report discusses a prediction technique, REEP (regression estimation of event probabilities), which resulted from attempts to make MDA more efficient. Comparative studies between REEP and MDA are included as well as other experimentations performed using the REEP procedure. Recommendations for future work on the technique are also given. (Author)

Information on the observations of Mars made at Soviet observatories during the opposition of 1956 is presented. Photographs and spectrograms of individual portions of the surface of Mars taken at many observatories through various light filters and polarimetric and micrometric measurements are discussed. Infrared photographs of Mars were obtained with an image translator. Numerous images of the planet were made in total light and through filters. Special electrophotometers were used to compare the brightness of various portions of Mars in different spectral regions.

AD-602 183 Div. 2
OTS Price $0.50

American Meteorological Society. Boston, Mass.
SOME PROPERTIES OF THE MARTIAN ATMOSPHERE INDICATED BY SPECTROPHOTOMETRIC OBSERVATIONS OF 1956,
by N. A. Kozyrev. Mar 64, 10p AmMetSoc T-R-429
Contract AF19 628 3880
TT 64 11825

Unclassified report

O Nekotorykh Svoistvakh Atmosfery Marsa po Spektrofotometricheskim Nablyudeniyam 1956 Goda, trans. of Akademiya Nauk SSSR. Krymskaya Astrofizicheskaya Observatoriya. Izvestiya, 1958, v. 18, p. 61-65.

Descriptors: (*Mars, Atmosphere) Planetary atmospheres, Optical properties, Spectrographic cameras, Spectrophotometers, Extraterrestrial topography, Optical analysis, USSR, Astrophysics.

In 1956, the contrast of the surface details of Mars decreased sharply, while the general color of the planet changed but little. It is concluded that the atmosphere became turbid only in the lowest layers and that no essential changes took place in the general optical properties of the atmosphere itself. Spectrograms of the polar cap, made in the second half of September and early October, showed it to be an atmospheric formation resulting from the condensation of the particles which cause normal scattering in the upper layers of the Martian atmosphere. (Author)

AD-602 189 Div. 2, 25
OTS Price $0.50

American Meteorological Society, Boston, Mass.
CLIMATIC CHANGE AND CLIMATE CONTROL,
by M. I. Budyko. Apr 64, 10p AmMetSoc T-R-436
Contract AF19 628 3880
TT 64 11829

Unclassified report

Izmenenie Klimata i Puti Ego Preobrazovaniya, trans. of Akademiya Nauk SSSR. Vestnik, 1962 v. 32 no. 7, p. 33-37.

Descriptors: (*Climatology, Theory), Atmosphere, Earth, Thermal properties, Control, Artificial precipitation, Glaciers, Ice islands, Meteorology, USSR.

The heat balance method together with certain other methods of theoretical climatology for investigating the laws of natural climatic changes and for determining the possibility of controlling such changes is discussed.

AD-602 192 Div. 2, 25
OTS Price $0.50

American Meteorological Society, Boston, Mass.
CONTROL OF METEOROLOGICAL PROCESSES,
by A. M. Gusev. Apr 64, 6p AmMetSoc T-R-438
Contract AF19 628 3880
TT 64 11833

Unclassified report

Voprosy Vozdeistviya na Meteorologicheskie Protsessy, trans. of Akademiya Nauk SSSR. Vestnik, 1962 [v. 32] no. 11, p. 135-136.

Descriptors: (*Meteorological parameters, Control), Symposia, Reports, Theory, Climatology, Meteorology, Ice, Thermodynamics, USSR.

A conference held in Leningrad on 11-13 June [1962] was devoted to problems of controlling climate. Sixteen reports, which may be divided arbitrarily into three groups, were delivered on individual aspects of the problem. The first group treated problems of modifying weather, clouds, precipitation, and other small-scale processes. The second group of reports was devoted to the main plan of controlling the climate of a considerable part of the northern hemisphere by acting on the ice of the Arctic basin. The third group of reports was devoted to individual aspects of the general problem of climatic modification.

AD-602 193 Div. 2, 25
OTS Price $0.50

American Meteorological Society, Boston, Mass.
PRELIMINARY RESULTS OF OBSERVATIONS OF MARS.
by N. P. Barabashov. Feb 64, 10p AmMetSoc T-R-426
Contract AF19 628 3880
TT 64 11834

Unclassified report

Predvaritel'nye Rezul'taty Nablyudenii Marsa, trans. of Akademiya Nauk SSSR. Vestnik, 1957 v. 27 no. 5, p. 34-36.

Descriptors: (*Mars, Astronomical data), Planets, Extraterrestrial topography, Planetary atmospheres, Optical properties, Optical analysis, USSR, Astrophysics, Infrared spectroscopy.

The observation period covered nearly 5 months in 1956. The atmosphere and surface of Mars were studied intensively with various astronomical instruments. On 3 to 4 December 1956, a conference was held, at which the participants in the observations reported on their investigations and discussed a number of questions connected with processing the results.

AD-602 194 Div. 2
OTS Price $1.00

American Meteorological Society, Boston, Mass.
INVESTIGATION OF VARIOUS FORMATIONS ON MARS,
by N. P. Barabashov. Feb 64, 34p AmMetSoc T-R-424
Contract AF19 628 3880
TT 64 11835

Unclassified report

Ob Issledovanii Razlichnykh Obrazovanii na Marse, trans, of Astronomicheskii Zhurnal (USSR) 1952, v. 29, no. 5, p. 538-555.

Descriptors: (*Mars, Physical properties), Astrophysics, Planets, Extraterrestrial topography, Planetary atmospheres, Color, Albedo (Astronomy), Astronomical data, Photographs, Visual inspection, USSR.

The following aspects are discussed: the surface structure of Mars and the colors and color variations of the Martian continent, seas and canals; the color and color variations of the polar caps (albedo in different spectral regions); the variations of the size and darkness of certain spots on the planet's surface that comprise vast moistened continental regions; the different types of bright regions on the surface and in the atmosphere; the variations of atmospheric transparency; and the variation and degree of polarization of the different formations on the planet.

On the basis of results measuring non-deviative absorption L sub D in the D-region with moderately high frequencies, the distribution law for electron density can be determined as a function of altitude. In order to do this, we solve an integral equation for absorption using an analytical method of successive expansion by a Taylor's series. Thus, by using the recorded L sub D during oblique incidence of an electromagnetic wave on a series of points, or by measuring absorption at several frequencies in the Al region, the form of N(z) in the D-region can be determined by simple methods, and its periodic variation can be controlled. (Author)

AD-602 140 Div. 2, 24
OTS Price $0.50

Army Electronics Research and Development [Agency]
Fort Monmouth, N. J.
AN EVALUATION OF TIROS VIII METEOROLOGICAL DATA FOR ARMY APPLICATIONS
by William J. Richards. Mar 64, 19p
Task 1AO 25001A126 01
AELRDL TR2439

Unclassified report

Descriptors: (*Meteorological satellites, Aerial photographs), (*Photogrammetry, Satellites (Artificial), Mapping, Photographic analysis, Weather forecasting, Meteorological parameters, Telemetering data, Position finding, Clouds, Storms, Television equipment, Photo interpretation, Photographic processing equipment, Weather communications.

Experience gained with TIROS VIII Automatic Picture-Taking (APT) System is described, and results are evaluated in terms of meteorological requirements of the field army. It is concluded that despite certain limitations in the first experimental version, the APT system offers a valuable addition to the Army's meteorological facilities. (Author)

AD-602 142 Div. 2, 25
OTS Price $1.00

Army Electronics Research and Development Agency ,
Fort Monmouth, N. J.
PRESSURE CALIBRATION OF THE GOETZ AEROSOL SPECTROMETER,
by Herman E. Gerber. Apr 64, 33p
Task 1A0 11001B021 14
AELRDL TR2456

Unclassified report

Descriptors: (*Meteorological instruments, Spectrum analyzers), (*Spectrum analyzers, Calibration), (*Aerosols, Spectroscopy), Centrifuges, Sensitivity, Pressure, Particle size, Measurement.

The report discusses and determines the pressure dependence of the operating characteristics of the Goetz Aerosol Spectrometer. Since the fallout of particles in the Goetz centrifuge depends on the mean free paths of the air molecules, the deposition characteristics of the aerosol particles (according to the Cunningham correction to the Stokes Law) become a function of air density or pressure. Calibration runs were conducted with monodisperse latex particles of various sizes in a pressure chamber simulating various atmospheric altitudes. The deposition lengths for aerosol particles of a given size decrease with decreasing pressure. The smaller the aerosol particles, the greater is the pressure dependence on the particle deposition. Correction factors could be determined for various particle sizes in atmospheric pressure. Some examples of application of these pressure calibrations to field measurements are presented. (Author)

AD-602 148 Div. 2, 15
OTS Price $0.50

American Meteorological Society, Boston, Mass.
CONCERNING THE ACCURACY OF DETERMINING THE POSITIONS OF THE TROPOPAUSE.
by Yu N. Bolkonskii. Dec 63, 6p AmMetSoc T-R-421
Contract AF19 604 6113
TT 64 11820

Unclassified report

O Tochnosti Opredeleniya Polozheniya Tropopauzy, trans. of Problemy Arktiki (USSR) 1958, no. 3, p. 109-110.

Descriptors: (*Tropopause, Determination), Errors, Height finding, Atmosphere, Radiosondes, Data, USSR.

Determination of the variation of the height of the tropopause on the basis of radiosonde data inevitably involves random errors. A method for determining the magnitude of these random errors was developed.

AD-602 161 Div. 2, 8
OTS Price $0.50

Naval Research Lab., Washington, D. C.
PERIODIC VARIATIONS OF THE TEMPERATURE AND WATER CURRENTS IN THE TONGUE OF THE OCEAN, BAHAMAS.
Interim rept.,
by Daniel Friedman. 8 Jun 64, 12p
NRL 6093

Unclassified report

Descriptors: (*Ocean currents, Analysis), (*Sea water, temperature), Periodic variations, Thermometers, Electronic equipment, Thermistors, Salinity, Data, Oscillators, Capacitors, Coaxial cables, Sound, Bahama Islands.

A preliminary study was made of the cyclic variations of temperature and current direction at a fixed location in the Tongue of the Ocean, Bahamas, for a time period of 27 hours. An electronic thermometer and a novel current direction meter were developed for this project. The thermometer was essentially an RC phase-shift oscillator using thermistors as the sensitive element controlling the output frequency. To obtain current directions a similar oscillator was used incorporating a capacitor unit controlling the output frequency. A magnet oriented part of the capacitor with the earth's field, and the capacitance varied when capacitor plates were rotated by the external vane. The current had a cyclic variation of about 180 degrees with a time period of about 9-1/2 minutes. The temperature had short-time fluctuations with about the same time period and had long-time fluctuations with a time period of about 2 hours. (Longer time periods were also indicated.) Of significance to the study of sound propagation is the finding that the phases of the periodic temperature fluctuations varried at different depths. (Author)

AD-602 180 Div. 2, 25
OTS Price $0.50

American Meteorological Society, Boston, Mass.
RESULTS OF OBSERVATIONS OF MARS,
by Yu. N. Lipskii. Feb 64, 8p AmMetSoc T-R-427
Contract AF19 628 3880
TT 64 11822

Unclassified report

Rezul'taty Nablyudenii Mars, trans. of Priroda (USSR) 1957, v. 46, no. 4, p. 105-106.

Descriptors: (*Mars, Astronomical data), Planetary atmospheres, Infrared spectroscopy, Electrophotography, Optical properties, Extraterrestrial topography, Albedo (Astronomy), Water, USSR.

Descriptors: (*Marine borers, Ultrasonic radiation), Sound transmission, Underwater sound, Marine biology, Aquatic animals, Transducers, Oscilloscopes, Voltmeters, High frequency, Power amplifiers, Intensity, Velocity, Acceleration, Pressure, Pest control, Wood.

The effects of ultrasonic vibrations on marine borers was investigated. A cursory examination of the effects of these vibrations on the test animal, Limnoria tripunctate, at two frequency ranges revealed that (a) the test animals were killed in the 40 kc range when they were close to the transducer, i.e., at high energy levels and (b) the 350-400 kc range, whose half wavelength was of the same order of magnitude as the test animal, was much less effective. The rate of loss of effectiveness with distance from the transducer, even at 40 kc, was so great that the use of ultrasonics to control marine borers would require tremendous amounts of power and would be uneconomical when compared with other methods of wood preservation. (Author)

AD-602 293 Div. 2, 6, 8
OTS Price $0.75

Naval Research Lab., Washington, D. C.
OCEAN WAVE PROFILING RADAR SYSTEM,
by C. W. Morrow. 21 Apr 64, 30p
Proj. RF001 02 41 4004
NRL 6052

Unclassified report

Descriptors: (*Ocean waves, Measurement), (*Radar equipment, Range finding), (*Radar scanning, Ocean waves), Airborne, Oceans, Surface properties, Mapping, Feasibility studies.

An airborne oceanographic sensor, using a precise radar-ranging technique, is used for high-speed profile mapping of the ocean wave structure. The instantaneous distance to a spot on the ocean surface contour directly beneath a low-altitude level-flying aircraft is continuously recorded on a roll chart. This record portrays a laterally compressed cross section of the ocean surface along the flight track. Frequency modulation of a cw microwave source is used to obtain a measure of transmission delay by phase comparison of the demodulated return with the modulating reference signal. The use of microwaves is necessary to develop a narrow vertical beam, from a convenient size aircraft antenna, in order to short-range spot-illuminate and resolve the fine structure in each ocean wave as the profile is followed. Wave heights may be resolved to less than 6 inches, over a dynamic range up to 50 feet, by making the radar-illuminated spot sufficiently small and the transmission bandwidth sufficiently large. Multi-path interference between reflecting wave facets within the beam may seriously distort the phase coherence of the side frequencies in an unsmoothed FM ranging system unless this distortion is minimized by the transmission of a diverse spectral bandwidth. The equipment thus uses a sinusoidal FM output over a 4-percent spectral bandwidth centered at 9400 Mc to overcome this effect and to obtain the resolution necessary to prove the principle. Flight tests over various sea states experimentally verified the feasibility of the system and helped to establish design parameters for future equipment. (Author)

AD-602 294 Div.2
OTS Price $1.50

Stanford Univ., Calif.
ANOMALOUS REMANENT MAGNETIZATION OF SOME KLAMATH RIVER ANDESITES.
Final rept., pt. 1,
by Donald F. Heinrichs. Jan 64, 60p
Contract AF19 604 8043, Proj. 8623,Task 862301
AFCRL 64-97 1

Unclassified report

Descriptors: (*Terrestrial magnetism, Rock (Geology)), (*Rock (Geology), Terrestrial magnetism), (*Geology, Petrology), Mineralogy, Structural geology, Geologic age determination, Geochemistry, Sedimentation, Rivers.

A section of the Western Cascade series of Tertiary volcanics with anomalous remanent magnetization directions was sampled. Five anomalous flows and three stable flows are studied in detail. The direction and intensity of the natural remanent magnetization (NRM) is measured before and after demagnetization experiments. The direction of the NRM vectors in the anomalous flows is almost horozontal in contrast to the usual sixty degree magnetic inclinations of the adjacent stable flows. The declinations of contiguous anomalous flows alternate between approximately twenty and two hundred degrees. The declinations, plus or minus 180 degrees, are consistent with the series as a whole. A study of the mineralogy shows that all the anomalous flows are slightly altered (propylitized) and that four of the five flows have a well-developed flow structure. Different mineral parameters were examined and plotted against variations in the magnetic properties of the flows, but the exact mechanism of the formation of the anomalous magnetic directions remains unknown. (Author)

AD-602 296 Div. 2, 25
OTS Price $3.00

Geophysical Inst., Univ. of Alaska, College.
AN INVESTIGATION OF SOLAR INDUCED PHENOMENA AT MAGNETICALLY CONJUGATE POINTS, PART I (CHAPTERS I-III).
Final rept., pt. 1
by Eugene M. Wescott and Keith B. Mather. May 64, 186p
UAG R146 P1
Contract AF19 628 2779, DASA Proj. 8653
AFCRL 64 274

Unclassified report

Descriptors: (*Terrestrial magnetism, Solar radiation), (*Solar radiation, Terrestrial magnetism), Geophysics, Earth, Magnetic fields, Diurnal variations, Oscillation, Atmospheric electricity, Aurorae, Cosmic rays, Absorption, Ionosphere, Solar wind.

The results of a comprensive study of a solar induced geophysical phenomena at pairs of stations linked by a magnetic field line are presented. Studies have established that magnetic variations (except S sub q), telluric currents, ionospheric absorption, visual auroras, VLF and ELF emissions and auroral X-rays occur in similar manner in conjugate areas--in time, form and amplitude. The variations of the magnetic field were the most thoroughly studied phenomena. It was found that auroral zone electrojets occur in conjugate patterns, and that a conjugate area, elongated in geomagnetic latitude, can be defined by comparisons of magnetic records. This conjugate area appears to move in time, as the electrojets depart somewhat from conjugate patterns. The magnetic variations at mid and low latitude due to the return current paths of the electrojets are conjugate to approximately the same degree as the 'primary' auroral zone activity. At very high latitudes there is a diurnal variation in the degree of correlation at conjugate points--probably due to the distortion of the magnetic field by the solar wind. (Author)

AD-602 297 Div. 2, 25
OTS Price $3.00

Geophysical Inst., Univ. of Alaska, College.
AN INVESTIGATION OF SOLAR INDUCED PHENOMENA AT MAGNETICALLY CONJUGATE POINTS, PART 2 (CHAPTERS IV-IX).
Final rept., pt. 2,

AD-602 195 Div. 2
OTS Price $0.50

American Meteorological Society, Boston, Mass.
SOME MEANS OF CONTROLLED CLIMATE,
by M. I. Budyko. Apr 64, 14p AmMetSoc T-R-435
Contract AF19 628 3880
TT 64 11836

Unclassified report

Nekotorye Puti Vozdeistviya no Klimat, trans. of Meteorologiya i Gidrologiya (USSR) 1962, no. 2, p. 3-8.

Descriptors: (*Climatology, Theory), Meteorological parameters, Control, Geophysics, Thermodynamics, Nuclear energy, Artificial precipitation, Ice, Meteorology, USSR.

Among the possible climate-control methods discussed are: Atomic energy, artificial precipitation; destruction of the polar ice, and reduction of the evaporation rate by a monomolecular film.

AD-602 196 Div. 2
OTS Price $2.25

American Meteorological Society, Boston, Mass.
THE BOTTOM RELIEF OF THE BERING SEA.
by G. B. Udintsev, I. B. Boichenko, and V. F. Kanaev.
Sep 63, 64p AmMetSoc T-R-393.
Contract AF19 604 6113
TT 64 11837

Unclassified report

Rel'ef Dna Beringova Morya, trans. of Akademiya Nauk SSSR, Institut Okeanologii. Trudy, 1959, v. 29, p. 17-64.

Descriptors: (*Ocean bottom topography, Bering Sea), (*Bering Sea, Ocean bottom topography), Marine geology, Hydrographic surveying, Oceanographic data, Maps, Scientific organizations, Oceanology, Reviews, USSR.

The Bering Sea is a deep-water sea with a maximum depth of 4420 m in Kamchatskiy Proliv and somewhat lesser depths (4151 and 4096 m, as far as is known) in the deep trough of the sea. The Bering Sea is much deeper than the shallow seas along the continental shelf. This is the deepest sea in the Far East; its maximum depth is 751 m greater than the corresponding depth of the Sea of Japan (3669 m) and 1046 m greater than that of the Sea of Okhotsk (3370m0. in the region north of Kamchatskiy Proliv, the bottom rises in the form of a sill, whose depth does not exceed 3589 m. The main feature of the Bering Sea is its division into two distinct parts: a vast shallow water area with depths less than 200 m and a deep basin with depths greater than 3000 m.

AD-602 202 Div. 2
OTS Price $0.50

American Meteorological Society, Boston, Mass.
CONCERNING N. A. KOZYREV'S ARTICLE 'EXPLANATION OF THE COLOR OF MARS BY THE SPECTRAL PROPERTIES OF ITS ATMOSPHERE',
by G. A. Tikhov. Mar 64, 8p AmMetSoc T-R-423
Contract AF19 628 3880
TT 64 11838

Unclassified report

Po Povodu Stat'i N. A. Kozyreva 'Ob'yasnenie Tsveta Marsa Spektral'nymi Svoistvami Ego Atmosfery, trans. of Akademiya Nauk SSSR. Krymskaya Astrofizicheskaya Observatoriya. Izvestiya, 1956, v. 16, p. 159-161.

Descriptors: (*Mars, Optical properties), Planets, Planetary atmosphere, Extraterrestrial topography, Color, Solar spectrum, Optical analysis, Astrophysics, USSR, Theory.

A rebuttal to N. A. Kozyrev's basic conclusion that the red color of Mars is determined solely by the properties of its atmosphere.

AD-602 251 Div. 2
OTS Price $2.60

Minnesota Univ., Minneapolis. School of Physics.
THE RELATIVE ABUNDANCES OF ENERGETIC HYDROGEN ISOTOPES PRODUCED IN SOLAR FLARES,
by C. J. Waddington and P. S. Freier. Jun 64, 24p CR-71
Contract Nonr710 60

Unclassified report

Descriptors: (*Solar flares, Hydrogen), (*Solar radiation, Charged particles), (*Hydrogen, Solar flares), Solar disturbances, Isotopes, Protons, Deuterons, Tritons, Helium, Alpha particles, Photographic emulsions, Balloons, Terrestrial magnetism.

The relative abundances of protons, deuterons and tritons were studied in photographic nuclear emulsions flown during the July 18th, 1961 solar flare event. These emulsions were exposed at a time and locality where there was a geomagnetic threshold and the consequent enrichment of the abundance ratios was used to reduce the abundance limits to lower values than those previously quoted. By including the results of previous alpha-particle measurements in these emulsions, the relative abundances of solar produced H1, H2, H3 and He above a given rigidity at this time were determined. The consequences of these observations are briefly discussed. (Author)

AD-602 273 Div. 2,12
OTS Price $5.00

Inter-range Instrumentation Group, White Sands Missile Range, N. Mex.
INITIATION OF THE METEOROLOGICAL ROCKET NETWORK,
Aug 61, rev., 322p
IRIG 105 60

Unclassified report

Descriptors: (*Meteorological instruments, Sounding rockets), (*Sounding rockets, Launching sites), Radiosondes, Telemeter systems, Data processing systems, Atmosphere, Acoustics, Density, Wind.

Contents: meteorological rocket network stations; meteorological rockets (Arcas, Loki); meteorological rocket sensors and telemetry; (wind sensors, rocket telemetry package, Robin falling sphere, Loki-Hasp rocket-sonde, rocket-type ranging and telemetry system, telemetered performance data, atmospheric effects), meteorological rocket data processing; meteorological rocket data application; (acoustics of the mesosphere, density, dynamics of the upper atmosphere and its energy unbalance, absorption method for measuring atmospheric density).

AD-602 289 Div. 2, 25
OTS Price $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF ULTRASONICS ON LIMNORIA,
by Harry Hochman. 3 Apr 64, 14p
NCEL N 590

Unclassified report

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-601 717 Div. 3, 4, 16
OTS Price $0.50

Royal Veterinary and Agricultural Coll., Copenhagen (Denmark).
FORMULATION OF STABLE SOLUTIONS OF TMB-4.
Final technical rept., 1 Mar 63-1 Mar 64
by Sv. Dalgaard-Mikkelsen. 1 Mar 64, 18p
Contract DA91 591EUC2837
Unclassified report

Descriptors: (*Oximes, Solutions), (*Solutions, Stability), Drugs, Purification, Decomposition, pH, Chemical analysis, Biological assay, Cholinesterase, Chemical warfare agents, Inhibition.

Stable water solutions of TMB-4, C12 can be formulated by sterilization by heating at 120C for 20 min., and by aseptic preparation with addition of preservatives. Decomposition of TMB-4 with loss of the ChE-reactivating activity takes place when pH of the solutions by addition of alkali is brought to 6-7. For the therapeutical use it might be desirable to bring the pH of the injection solution as close to that of the biological fluids as possible. However, as pH of water solutions of TMB-4, C12 is 3-4 dependent on concentration, and the optimum stability is obtained within this pH range it seems practical to make the formulations solely as water solutions without addition of alkali. As heating at 120C for 20 min. has only a negligible decompository effect on TMB-4 in water solutions at pH 3-4 this sterilization process would be preferable. (Author)

AD-601 919 Div. 3, 13, 18
OTS Price $2.75

Litton Systems, Inc., St. Paul, Minn.
COLLECTIVE PROTECTION FOR COMBAT FIELD STRUCTURES.
Bimonthly progress rept. no. 5, 1 Mar-30 Apr 64.
by M. I. Landsberg. 20 May 64, 136p LSI 2573
Contract DA18 108AMC214A, Proj. 52405
Unclassified report

Descriptors: (*Shelters, Safety), (*Armed forces research, Biological warfare), (*Biological warfare agents, Decontamination), (*Compressors, Environmental tests), Countermeasures, Materials, Protective coverings, Air, Purification, Gas filters, Ventilation, Laminates, Evaporators, Contamination.

During this period, the modified 60-cycle compressor was impacted with a 15-g load on each of its three planes, with no apparent damage. Subsequently, capacity tests were run for 22-1/2 hours, revealing no deficiencies. As a final check, the compressor was opened by the manufacturer who found no more than normal wear. Thus, it appears that the compressor is capable of meeting shock and vibration requirements. Another area of emphasis was challenging of the collective protective kit (for the GP medium tent) with B and C simulants. Considerable information is being accumulated on the level of contamination in the airlock and liner when the integrity of the system is broken by people entering and leaving, and regarding the influence of decontamination procedures on liner cleanliness. Other areas investigated were: modification of linear design to incorporate a load-bearing catenary system (in lieu of the present patches) to improve the suspension system; evaluation of a reflectorized air-gap liner in order to reduce weight and cubage; ordering of major components for the 60-cycle multiple-component environmental control system (ECS) package and 400-cycle single ECS package; evaluation of a variety of airlock doors to permit selection of optimum material and method of closure. (Author)

AD-602 008 Div. 3
OTS Price $0.50

Aerojet-General Corp., Downey, Calif.
AGENT PROTOTYPE MUNITION DISSEMINATION SYSTEMS.
Progress rept. for Mar-May 64,
by R. L. MacLean, P. A. O'Donovan, and H. E. Wolfe.
25 Jun 64, 18p AGC 0843 01 01QP
Contract DA18 035AMC117A
Unclassified report

Descriptors: (*Chemical warfare agents, Test facilities), (*Explosive materials, Mixtures), CS agents, RDX, Design, Laboratories, Atomization, Temperature, Waxes, Organic materials, Crystal growth, Aromatic compounds, Acids (Excluding amino).

The work performed to date under the contract included efforts in the following areas: (a) Monitoring of the design of test facility which is being designed and built with corporate funds for use in performance of the contract. (2) Studies of intimate mixes of high explosives and agents. (3) Production of small spherical particles of solid agents.

AD-602 097 Div. 3, 10, 22
OTS Price $0.75

Oklahoma Univ. Research Inst., Norman.
NEW CONCEPTS FOR FLAME WEAPONS.
Progress rept. no. 1, 11 Mar-15 Jun 64
by J. D. Palmer and C. M. Sliepcevich. 19 Jun 64, 29p
Contract DA18 035AMC116A, Proj. 1454
Unclassified report

Descriptors: (*Flame warfare, Scientific research), Incendiary ammunition, Flame throwers, Incendiary mixtures, Thermodynamics, Heat transfer, Ignition, Combustion, Fluid mechanics, Fuels, Targets, Vulnerability, Ordnance, Research program administration.

The scope of this project is as follows: (1) Study targets for attack by flame or incendiary weapons. (2) Perform theoretical and experimental investigations on the physics of ignition and combustion of materials, flame dynamics, and heat transfer characteristics to provide basic data upon which requirements for new concepts of flame weapons can be based.

by Eugene M. Wescott and Keith B. Mather. May 64, 172p
UAG R146 P2
Contract AF19 628 2779, DASA Proj. 8653
AFCRL 64 274

Unclassified report

Descriptors: (*Terrestrial magnetism, Solar radiation), (*Solar radiation, Terrestrial magnetism), Geophysics, Earth, Magnetic fields, Electric fields, Electric currents, Diurnal variations, Oscillation, Aurorae, Atmospheric electricity, Cosmic rays, Absorption, Ionosphere.

Contents:
Conjugacy of telluric currents
Conjugacy of visual auroras
Conjugacy of ionospheric absorption
Conjugacy of radio auroras at 50-55 mc/s

AD-602 300 Div. 2, 20
OTS Price $2.25

Washington Univ., Seattle.
OROGRAPHIC DEFORMATION OF WIND FLOW.
Final rept., 1 May 62-30 Sep 63,
by K. J. K. Buettner, G. Maykut, J. Turner, and J. Zimmerman.
May 64, 88p
Contract DA36 039sc89118, Proj. 1A011001B02101

Unclassified report

Descriptors: (*Mountains, Atmospheric motion), (Wind, Mountains), Meteorological parameters, Terrain, Zinc compounds, Sulfides, Tracer studies, Wind-direction indicators, Theodolites, Simulation, Radioactive fallout, Numerical analysis.

As an initial step in the study of fallout over mountainous terrain, a ridge station was instrumented in the Ipsut Pass area of Mount Rainier National Park, Washington. Here tracer particles of zinc sulfide were released and collected during periods of weak and medium strength winds. The chemical used is fluorescent and numbers may be counted by microscopic examination,but a faster and more accurate method was to bombard samples with alpha-rays and count the resulting scintillations. The wind field was studied by means of pibals and double theodolite techniques. In addition to studies made in the field, a numerical experiment to determine the field of concentration from a point or line source, was also undertaken. A large scale, two-dimensional study over a mountain range, along with smaller scale, three-dimensional lee side studies, was made. The basic diffusion equation was used to describe the mechanisms of advection and diffusion; additional terms were then included to account for gravitational settling and washout by rain. (Author)

AD-601 718 Div. 4
OTS Price $0.50

Royal Holloway Coll., Univ. of London (England).
ADSORPTION OF FLUOROCARBONS ON POROUS SOLIDS.
Final rept.,
by O. E. Facey. 1963, 19p
Contract DA91 591EUC2704

Unclassified report

Descriptors: (*Fluorocarbons, Absorption), (*Gels, Absorption), Fluorine compounds, Butanols, Ethanols, Halohydrins, Sodium compounds, Dioxides, Iron compounds, Oxides, Surface tension, Thermochemistry.

General results from previous reports are collected and discussed. A short description of apparatus and techniques is also given. Isotherms of n-perfluorobutanol and 2-fluoroethanol on silica and ferric oxide gels at 25C are reported. (Author)

AD-601 732 Div. 4
OTS Price $1.10

North Carolina Univ., Chapel Hill.
STUDIES IN THE CHEMISTRY OF METAL-CHELONATES.
Final rept.,
by Charles N. Reilley. 20 Nov 62, 10p
Contract AF49 638 333
AFOSR 4312

Unclassified report

Descriptors: (*Chelate compounds, Reviews), Metalorganic compounds, Complex compounds, Electrochemistry, Biochemistry, Chemical analysis, Scientific research, Bibliographies, Abstracts.

A summary of work done under the contract is followed by an annotated bibliography of the 17 published reports generated by the researches.

AD-601 743 Div. 4
OTS Price $1.00

California Univ., Los Angeles.
MOLECULAR WEIGHT DEPENDENCE OF THE GLASS TRANSITION TEMPERATURE IN SODIUM PHOSPHATE POLYMERS.
Technical rept. no. 2,
by A. Eisenberg and T. Sasada. 10 Jun 64, 32p
Contract Nonr233 87

Unclassified report

Descriptors: (*Inorganic polymers, Transition temperature), (*Sodium compounds, Phosphates), Polymers, Ions, Phase studies, Glass, Molecular structure, Molecular weight, Thermochemistry, Thermal expansion, Density, Theory.

It is shown that an inorganic ionic polymer (sodium polyphosphate) exhibits the same type of glass transition temp. versus average chain length behavior as non-ionic organic polymers. If the chain ends resemble the terminal units, specifically in terms of the number of anions per phosphorus atom, the material is entirely analogous in its behavior to the organic materials, as shown, for instance, by the applicability of the Gibbs-DiMarzio theory. By contrast, if the terminal units possess two anions per phosphorus atom, a profound change in behavior is observed. (Author)

AD-601 786 Div. 4, 22
OTS Price $1.25

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
AMINO NITROGEN-15 TRACER STUDIES OF THE NITROLYSIS OF HEXAMETHYLENETETRAMINE.
Technical rept.,
by Thomas C. Castorina and Joseph R. Autera. May 64, 49p
Proj. 599 25 001
PA TR3116

Unclassified report

Descriptors: (*Amines, Decomposition), (*RDX, Synthesis (Chemistry)), (*HMX, Synthesis (Chemistry)), Tracer studies, Labeled substances, Nitrogen, Formaldehyde, Polymers, Exchange reactions, Ammonium compounds, Nitrates, Mass spectroscopy, Explosive materials, Preparation.

The path of amino nitrogens in the nitrolysis of hexamethylenetetramine (hexamine) to a mixture of the homologous cyclic methylenenitramines, 1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane (HMX) and 1,3,5-trinitro-1,3,5-triazacyclohexane (RDX), was traced using nitrogen-15. The equilibration of hexamine and ammonium nitrate amino-nitrogens in the formation of the stable intermediate, 1,5-dinitroendomethylene-1,3,5,7-tetraazacyclooctane (DPT), during the first stage of nitrolysis is attributed to exchange. Only the trimethylene-substituted and not the dimethylene-nitro-substituted amino-nitrogens in DPT undergo interchange with the ammonium ion. DPT does not cleave selectively in the formation of HMX and RDX during the second stage of nitrolysis. In the absence of paraformaldehyde, HMX and RDX are derived essentially from hexamine nitrogens with only a small fraction of approximately 5% of RDX derived from ammonium nitrate. In the presence of paraformaldehyde added initially to the reaction mixture, 7% of the HMX and 40% of the RDX are formed from ammonium nitrate. A mechanism is proposed in which the fragment of the type $HOCH_2\dot{N}HNO_2$ exists as the common precursor to HMX and RDX. (Author)

AD-601 838 Div. 4, 16
OTS Price $0.50

California Univ., San Francisco.
SYNTHESIS OF STEREOSPECIFIC AMINOTHIOLS AS RADIOPROTECTIVE AGENTS.
Interim progress rept., 1 Mar 63-1 Mar 64
by J. Cymerman Craig. 1 Mar 64, 9p
Contract DA49 193md2145

Unclassified report

Descriptors: (*Radioprotective agents, Thiols), (*Thiols, Synthesis (Chemistry)), (*Organic nitrogen compounds, Synthesis (Chemistry)), N-heterocyclic compounds, S-heterocyclic compounds, Spiro compounds, Cyclopentanes, Cyclopentenes, Stereochemistry.

Trans-2-(n-octylamino)-cyclopentanthiol and trans-2-(n-decylamino)-cyclopentanthiol were synthesized and submitted for testing. The preparation of cis- and trans-1-amino-indane-2-thiol is in progress. Successful reduction methods were developed for the preparation of 2-methyl-4, 5-cyclopentano-thiazolidine and spiro-2, 2-cyclohexano-4, 5-cyclopentano-thiazolidine. The conversion of these two key compounds into the required cis-2-aminocyclopentanthiol is under examination. (Author)

AD-601 839 Div. 4, 16
OTS Price $0.50

California Univ., San Francisco.
SYNTHESIS OF STEREOESPECIFIC AMINOTHIOLS AS RADIOPROTECTIVE AGENTS.
Progress rept., 1 Jul 62-1 Mar 63,
by J. Cymerman Craig. 1 Mar 63, 3p
Contract DA49 19md2145

Unclassified report

4. CHEMISTRY

AD-601 691 Div. 4
OTS Price $1.60

Wisconsin Univ., Madison.
PI-BONDED ORGANOSILICON COMPOUNDS.
Final rept., 1 Feb 62-1 Jan 64,
by Robert West. 20 Apr 64, 11p
Grant AF AFOSR62 244
AFOSR 64 1090

Unclassified report

Descriptors: (*Silanes, Chemical bonds), (*Silanes, Free radicals), (*Azides, Metalorganic compounds), (*Metalorganic compounds, Spectroscopy), Silicon compounds, Ions, Atomic orbitals, Electron transitions.

Summaries are given of researches in the following areas: siliconium ions; organometallic azides; organosilicon free radicals; electronic spectra of organometallic compounds.

AD-601 692 Div. 4
OTS Price $1.10

Mississippi Univ., University.
SPECTROPHOTOMETRIC AND NON-SPECTROPHOTOMETRIC STUDIES OF SOLUTIONS.
Summary rept.,
by P. A. D. deMaine. 1964, 8p
Grant AF AFOSR62 19
AFOSR 64 1109

Unclassified report

Descriptors: (*Solutions, Chemical properties), (*Complex compounds, Solutions), Spectroscopy, Theory, Phosphonitrile chlorides, Aromatic compounds, Nitrobenzenes, Iodine, Organic sulfur compounds, Carbon tetrachloride, Infrared spectroscopy, Molecular association, Rare earth compounds, Chlorides, Programming (Computers).

Summaries are given of researches in the following areas: cryoscopic studies; theoretical projects; spectral studies of systems containing phosphonitrilic chlorides; complex formation between aromatic hydrocarbons and some nitro compounds; solvent effects on charge-transfer complexes between 1,3,5-trinitrobenzene and aromatic hydrocarbons in different solvents; spectrophotometric study of interactions between iodine and aryl methyl sulfides in carbon tetrachloride; infrared spectral studies of complex formation; molecular interactions studied by means of precision dielectric constant measurements; conductance and viscosity studies of rare earth chlorides; and computer methods.

AD-601 695 Div. 4
OTS Price $1.10

New York Univ., N. Y.
ORIENTATION AND REACTIVITY IN FREE RADICAL AROMATIC SUBSTITUTION.
Final technical rept., 1961-63,
by Robert T. Morrison. 17 Apr 64, 8p
Grant AF AFOSR62 34
AFOSR 64 1108

Unclassified report

Descriptors: (*Free radicals, Substitution reactions), (*Aromatic compounds, Substitution reactions), Molecular structure, Reaction kinetics, Chromatographic analysis, Oxygen, Peroxides, Solvents, Benzoic acids.

It was shown that data from product analysis give valid rate factors for free radical aromatic substitution, not only removing current doubts but putting these rate factors on firmer footing than ever before. A method of analysis of biaryl mixtures was worked out that gives rate factors about ten times as accurate as previous methods have given; and a method was devised for collecting reference samples of biaryls that elimates the need for lengthy synthesis. Rate factors were measured by this method for eight peroxide-substrate systems, and it was found that these results are consistent with the operation of polar effects. It was found that, in certain cases, the esters reported from peroxide decomposition are not the simple substituted phenyl benzoates previously assumed. Data were obtained about the effect of oxygen and peroxide concentration on yield of benzoic acid that strongly suggest the operation of a cage effect in free radical substitution.

AD-601 705 Div. 4
OTS Price $1.60

Atlantic Research Corp., Alexandria, Va.
A STUDY OF THE TRAPPING OF FREE ALKYL RADICALS.
Final technical rept. Sep 58-Dec 61.
by Joseph B. Levy. 22 Dec 61, 13p
Contract AF49 638 483, Proj. 9763, Task 37630
AFOSR 2037

Unclassified report

Descriptors: (*Free radicals, Separation), (*Butane, Organic nitrogen compounds), (*Ketones, Benzyl radicals), Butyl radicals, Alkyl radicals, Cooling, Pyrolysis, Reaction Kinetics, Acetone, Deposits.

The kinetics and mechanism of the decomposition of 2,2'-azoisobutane, the compound chosen as the source of the free radicals, were studied. In the next phase of the work studies of the pyrolysis of 2,2' -azoisobutane in a fast flow system were performed. The suitability of this compound as a source of t-butyl radicals was demonstrated by mirror removal studies and many experiments performed under a variety of conditions in which it was attempted to demonstrate the presence of trapped t-butyl radicals. The last portion of this program was devoted to a study of the colored deposits obtained in the pyrolysis of dibenzyl ketone. (Author)

AD-601 708 Div. 4
OTS Price $1.10

Pennsylvania State Univ., University Park.
REVERSIBILITY OF RADICAL-OLEFIN REACTIONS.
Final rept.,
by P. S. Skell. 29 Oct 62, 6p
Contract AF49 638 457
AFOSR 3910

Unclassified report

Descriptors: (*Free radicals, Chemical equilibrium), (*Alkenes, Polymerization), (*Styrenes, Polymerization), (*Polyvinyl chloride, Free radicals), Molecular isomerism, Tracer studies, Chemical reactions, Decomposition, Synthesis (Chemistry).

It was the major object of the program to learn the conditions necessary for radical decomposition with special emphasis on depropagation in polymer forming systems, depropagation being measured by cistrans isomerization of isotopically labeled monomers. This objective was achieved for styrene and vinyl chloride. Concomitant with these studies, many areas dealing with reversibility of simpler radical-olefin additions and rearrangements were examined with considerable profit. (Author)

Infrared end-group analysis indicates a degree of polymerization of a least 20 for a zinc derivative of dithiooxamide prepared by the interfacial polymerization reaction of zinc acetate with dithiooxamide. The degrees of polymerization of zinc derivatives of 2,5-dihydroxy-p-benzoquinone prepared by two-stage reactions from diethylzinc and 2,5-dihydroxy-p-benzoquinone are estimated to be 4 and 27 by chemical end-group analysis. The conditions of the second step, the heating of the intermediate C2H5ZnO2C6H2O2H, determine the degree of polymerization. (Author)

AD-602 109 Div. 4, 14, 25
OTS Price $0.50

National Research Corp., Cambridge, Mass.
HEATS OF FORMATION OF B2O3 (CRYSTALLINE) AND B2O3 (AMORPHOUS).
Special rept.
by Ludwig G. Fasolino. 2 Jun 64, 17p
Contract Nonr 3608 00

Unclassified report

Descriptors: (*Thermochemistry, Boron compounds), (*Boron compounds, Oxides), Heat of formation, Boric acids, Heat of solution, Phase studies, Crystals, Glass, Transition temperature, Test equipment, Calibration.

From measurements of the heats of solution of B2O3 (crystalline), B2O3 (amorphous), and H3BO3, the heats of formation of B2O3 (crystalline) and B2O3 (amorphous) were calculated. From this work, the crystalline-amorphous heat of transformation was also calculated. (Author)

AD-602 136 Div. 4, 25
OTS Price $0.50

Birkbeck Coll., London (England).
X-RAY CRYSTALLOGRAPHIC STUDIES OF AMINO-BORANES AND RELATED COMPOUNDS.
Final technical rept. no. 1, 1 Oct 62-31 Mar 64,
by G. J. Bullen. 31 Mar 64, 18p
Contract DA91 591EUC2713

Unclassified report

Descriptors: (*Organoboranes, Crystal lattices), (*N-heterocyclic compounds, Organoboranes), Single crystals, Crystal structure, Symmetry (Crystallography), Chemical bonds, X-ray diffraction analysis, X-ray photography, Great Britain.

The lattice parameters and space groups of crystals of five compounds containing B-N bonds were determined, by means of X-ray photographs, as a preliminary to a detailed X-ray structure analysis of some of these substances. Compounds studied were: B-trifluoroborazole; diisopropylamino diphenylborane; diisopropylamino di-(p-bromophenyl) borane; bi-(1,3-demethyl-1,3,2-diazaborolidin-2-yl); and 1,4-diphenyl-2,3,5,6-tetramethyl-2,3,5,6-tetraza-1,4-diborine. Diisopropylamino-(p-bromophenyl)-phenylborane was also examined but it proved impossible to produce single crystals of this compound suitable for X-ray work.

AD-602 181 Div. 4, 14
OTS Price $0.50

American Meteorological Society, Boston, Mass.
ELECTROPHYSICAL PROPERTIES OF POLYMERIC PHTHALOCYANINES,
by E. I. Balabanov, E. L. Frankevich, and L. G. Cherkashina. Mar 64, 16p AmMetSoc T-R-433
Contract AF19 628 3880
TT 64 11823

Unclassified report

Issledovanie Elektrofizicheskikh Svoistv Polimernykh Ftalotsyaninov, trans. of Vysokomolekulyarnye Soedineniya (USSR) 1963, v. 5, no. 11, p. 1684-1690.

Descriptors: (*Metalorganic compounds, Polymers), (*Phthalocyanines, Polymers), (*Polymers, Electrical conductance), Copper compounds, Organic pigments, Physical properties, Electrical properties, Synthesis (Chemistry), Mass spectroscopy, Benzenes, Carboxylic acids.

Polymers of copper phthalocyanine were synthesized from pyromellitic acid and, after vacuum treatment, had electric conductivity at 300K = 0.0001 to 0.00001 mho 1/cm. A mass spectrometer was used to investigate the composition of the gases released during vacuum treatment and it was shown that the increase of specific electric conductivity which occurs in this case is associated with the removal of the oxygen-containing molecules that act as acceptors of electrons. It was shown that the decrease of the specific electric conductivity of the samples left in air is associated with the adsorption of water and with the oxidation of the polymer by atmospheric oxygen. (Author)

AD-602 182 Div. 4, 14
OTS Price $0.50

American Meteorological Society, Boston, Mass.
POLYMERS WITH A CONJUGATED BOND SYSTEM AND HETEROATOMS IN THE CONJUGATION CHAIN. XX. SYNTHESIS OF POLYMERIC PHTHALOCYANINES AND INVESTIGATION OF THEIR BASIC PHYSICOCHEMICAL PROPERTIES,
by A. A. Berlin, L. G. Cherkashina and E. I. Balabanov.
Mar 64, 16p AmMetSoc T-R-431
Contract AF19 628 3880
TT 64 11824

Unclassified report

Polimery s Sistemoi Sopryazhennykh Svyazei i Geteroatomami v Tsepi Sopryazheniya. XX. Sintez i Issledovanie Osnovnykh Fiziko-Khimicheskikh Svoistv Polimernykh Ftalotsyaninov, trans. of Vysokomolekulyarnye Soedineniya (USSR) 1962, v. 4, no. 3, p. 376-382

Descriptors: (*Metalorganic compounds, Polymers), (*Phthalocyanines, Polymers), (*Polymers, Synthesis (Chemistry)), Copper compounds, Organic pigments, Physical properties, Chemical properties, Spectra (Infrared), Molecular structure, Thermal properties, Stability, Electrical conductance, Nuclear paramagnetic resonance, Phthalic acids, Anhydrides, Benzenes, Carboxylic acids, Ethers.

Polymeric phthalocyanines from (I) pyromellitic acid and phthalic anhydride and from (II) 3, 3', 4, 4' -tetracarboxydiphenyl ether and phthalic anhydride were synthesized and their phisicochemical properties were determined. (Author)

AD-602 190 Div. 4, 14
OTS Price $0.50

American Meteorological Society, Boston, Mass.
STUDIES OF CHELATE POLYMERS. V. CHELATE POLYMERS OF BIS-DITHIOCARBAMIC ACIDS AND METALS,
by A. P. Terent'ev, E. G. Rukhadze, and V. V. Rode.
Mar 64, 18p AmMetSoc T-R-432
Contract AF19 628 3880
TT 64 11830

Unclassified report

Issledovaniya v Ryadu Khelatnykh Polimerov. V. Khelatnye Polimery Bis-Ditiokarbaminovykh Kislot s Metallami, trans. of Vysokomolekulyarnye Soedineniya (USSR) 1962, v. 4, no. 6, p. 821-827.

Descriptors: (*Radioprotective agents, Thiols), (*Thiols, Synthesis (Chemistry)), (*Organic nitrogen compounds, Synthesis (Chemistry)), N-heterocyclic compounds, S-heterocyclic compounds, Cylopentanes, Acetates.

The synthesis of cis-2-aminocyclopentanthiol from 2-methylcyclopentanothiazoline was found to be not practicable. The following were obtained as intermediates: S,N,N-tribenzol-cis-2-aminocyclopentane (m.p. 167-1680); S-acetyl-cis-2-benzamidocyclopentane thiol (m.p. 132-133C); S-acetyl-cis-2-acetamidocyclopentane thiol (m.p. 63-64C); cis-1-acetyl-2-methyl-4-oxobicyclo-(5.0.3)-1-aza-5-thiadec-2-ene (m.p. 137.5-139C).

AD-601 937 Div. 4
OTS Price $1.25

Rutgers Univ., New Brunswick, N. J.
REACTIONS OF CHLORINE DIOXIDE AND OTHER OXY-CHLORD COMPOUNDS WITH ORGANIC COMPOUNDS.
Annual rept., no. 2, 1 Sep 62-31 Aug 63,
by M. L. Granstrom and B. M. Israel. 31 Aug 63, 44p
Contract DA CML18 108G26

Unclassified report

Descriptors: (*Chlorine compounds, Dioxides), (*Oxychlorides, Chemical reactions), Hydrogen compounds, Hypochlorites, Dissociation, Ions, pH, Temperature, Buffers, Volumetric analysis, Chromatographic analysis, Spectroscopy, Reaction kinetics.

The objective of the research was the study of the reaction: g HOCl + h ClO2 anion yields p ClO2 + g ClO3 anion + Cl anion. It was necessary to determine values of g, h, p, q, and r, and since the relative values apparently do shift with such changes in experimental conditions as pH, temperature, buffer concentration, etc. it became necessary to establish a rather detailed procedure for measurements of each molecular species. Under certain experimental conditions the reaction proceeds slowly enough to follow spectrophotometrically and to trace absorbancies with time. One then is able to calculate concentrations of the two reactants, HOCl and ClO2 anion, and the first product, ClO2, during the course of the reaction. Values of concentration of ClO3 anion and Cl anion were determined at the completion of the reaction because no known method allows measurement of concentration of ClO3 anion and Cl anion rapidly enough to trace values during the course of the reaction. Also, efforts were made to study the kinetics of the above reaction. (Author)

AD-602 060 Div. 4, 25
OTS Price $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
THE BAND SPECTRUM AND DISSOCIATION ENERGY OF ClF.
by Heinz Schmitz and Hans Joachim Schumacher.
15 May 64, 7p
RSIC 183; TT 64 11815

Unclassified report

Trans. of Zeitschrift fur Naturforschung (West Germany) 1947, v. 2a, p. 359-362.

Descriptors: (*Chlorine compounds, Fluorides), Absorption spectrum, Band spectrum, Dissociation, Thermochemistry, Fluorine, Excitation, Atomic energy levels, West Germany.

The existence of absorption bands of gaseous chlorine fluoride (1.5 atm. at r.t.) between 4600 and 5300 Angstrom units was confirmed. Results are presented in pictorial and tabular form. The dissociation energy of ClF was found to be 60.3 ± 0.5 kcal in the case of decomposition to excited F and normal Cl, and 58.9 ± 0.5 kcal in the case of decomposition to excited Cl and normal F. Based upon these results, the dissociation energy of molecular fluorine was determined to be 33.4 kcal or 30.6 kcal, depending on whether the value 60.3 or 58.9 was used.

AD-602 069 Div. 4, 17, 25
OTS Price $0.50

Army Materials Research Agency, Watertown, Mass.
THE DISSOCIATION ENERGIES OF DIATOMIC MOLECULES OF THE TRANSITION ELEMENTS. PART I. NICKEL.
by Arthur Kant. Jun 64, 14p
Proj. 1A010501B010
AMRA TR64 11

Unclassified report

Descriptors: (*Nickel, Dissociation), Transition elements, Diatomic molecules, Vapors, Mass spectroscopy, Thermochemistry, Heat of sublimation.

The Ni2 molecule was shown to exist in the vapor phase over liquid nickel above 2000K. Using information derived from a combination of effusion and mass spectrometric techniques, the dissociation energy of Ni2 was calculated from the ratio of dimeric and monomeric nickel in equilibrium with liquid. The resulting value = 54.5 ± 5 kcal. From the accepted value of the heat of sublimation of nickel and the dissociation energy of the dimer the heat of sublimation for the process 2 Ni (solid) = Ni2(gas) is, at 0 K, 146.9 ± 7 kcal. (Author)

AD-602 087 Div. 4
OTS Price $0.50

Olin Mathieson Chemical Corp., New Haven, Conn.
CHEMISTRY OF DECABORANE-PHOSPHORUS COMPOUNDS. V. SYNTHESIS AND PHOSPHINATION OF BROMOCARBORANES.
Technical rept. no. 24
by Hampton D. Smith, Thomas A. Knowles, and Hansjuergen Schroeder. Jul 64, 16p
Contract Nonr3395 00, Proj. NR356 431

Unclassified report

Descriptors: (*Organoboranes, Synthesis (Chemistry)), (*Decaboranes, Synthesis (Chemistry)), (*Phosphinoborines, Synthesis (Chemistry)), (*Bromine compounds, Decaboranes), Heat-resistant materials, Polymers, Boron compounds, Bromination, Chlorination, Catalysts, Aluminum compounds, Halides, Bromides, Chlorides, Phosphines, Heterocyclic compounds.

Aluminum halide catalyzed bromination of carborane and neocarborane resulted in a stepwise substitution with tribromocarborane and dibromoneocarborane respectively, as the ultimate products. Further halogenation was achieved with chlorine to give B10H2Br3Cl5C2H2, B10Br2Cl8C2H2, and neo-B10Br2Cl8C2H2. Some reactions of the bromocarboranes including the preparation of phosphorus derivatives are described. (Author)

AD-602 091 Div. 4
OTS Price $0.50

Pennsalt Chemicals Corp., Philadelphia, Pa.
POLYMERIC ZINC DERIVATIVES OF SIMPLE BISCHELATING AGENTS.
Technical rept. no. 39
by Selwyn H. Rose, B. P. Block, and J. E. Davis. May 64, 15p
Contract Nonr2687 00, Proj. NR356 408

Unclassified report

Descriptors: (*Zinc compounds, Polymers), (*Metal-organic compounds, Polymers), (*Polymers, Metalorganic compounds), Chelate compounds, Polymerization, Molecular structure, Spectra (Infrared), Organic sulfur compounds, Amides, Quinones, Alcohols.

AD-602 272 Div. 4, 14
OTS Price $2.25

American Cyanamid Co., Stamford, Conn.
CHEMILUMINESCENT MATERIALS.
Technical rept. no. 4, 1 Mar-31 May 64
by M. M. Rauhut, L. J. Bollyky, D. Sheehan, R. A. Clarke, and A. M. Semsel. 31 May 64, 90p
Contract Nonr-4200 00, Proj. NR356 452; ARPA Order 299; Amend. 3

Unclassified report

Descriptors: (*Photochemistry, Luminescence), (*Luminescence, Materials), Peroxides, Chlorides, Hydrazones, N-heterocyclic compounds, Anthracenes, Synthesis (Chemistry), Chemical reactions, Electrolysis, Atomic orbitals, Excitation.

Progress in determining the processes fundamental to chemiluminescence is described with particular reference to (1) mechanism studies of oxalyl peroxide, 3-aminophthalhydrazide, and anthracene photoperoxide chemiluminescent reactions; (2) synthesis and exploratory studies of potentially new chemiluminescent materials; and (3) energy transfer studies in chemiluminescent systems. (Author)

AD-602 282 Div. 4, 25
OTS Price $0.50

Theoretical Chemistry Inst., Univ. of Wisconsin, Madison.
CORRELATION ENERGY OF TWO-ELECTRON SYSTEMS,
by Jean L. J. Rosenfeld and Daniel D. Konowalow.
10 Jun 64, 20p WIS TCI-30
Contract AF33 657 7311; Grant NsG275 62

Unclassified report

Descriptors: (*Atomic orbitals, Wave functions), Atomic energy levels, Functions, Correlation techniques, Quantum mechanics, Field theory, Helium, Electrons.

Correlated closed-shell and open-shell functions (due to Roothaan and Weiss) are analyzed in terms of a 1/Z expansion to obtain the corresponding first order wave functions and the second order energy. The need for expanding the open-shell functions in powers of Z to the minus 1/2 power is demonstrated. The contributions to the second order energy from radial and angular correlation are estimated. (Author)

AD-602 290 Div. 4
OTS Price $0.50

Ozark-Mahoning Co., Tulsa, Okla.
SYNTHESIS OF NEW FLUORINE CONTAINING COMPOUNDS.
Quarterly technical summary rept. for 1 Apr-30 Jun 64,
by J. B. Beal, Jr. and C. Pupp. 8 Jul 64, 9p
Contract AF04 611 9556, ARPA Order 24, Amend. 65, Task 15

Unclassified report

Descriptors: (*Fluorine compounds, Synthesis (Chemistry), Chemical reactions, Solidified gases, Infrared spectrophotometers, Salts, Melting, Electrolysis, Stainless steel, Nickel, Electrochemistry.

The report describes work on solid-gas reactions, infrared analysis of products of previous experiments using a Perkin-Elmer IR-337 Spectrophotometer, and salt fusions and electrolysis of molten salts. The fusions were carried out in a nickel crucible or glass tube. Electrolyses were carried out in a stainless steel cell into which a nickel crucible containing the salts was placed. (Author)

Descriptors: (*Metalorganic compounds, Polymers), (*Chelate compounds, Polymers), (*Carbamic acids, Chelate compounds), Thio acids, Nickel compounds, Zinc compounds, Cobalt compounds, Copper compounds, Synthesis (Chemistry), Molecular weight, Tracer studies, Physical properties, USSR.

Chelate polymers of ethylene-, hexamethylene-, p-phenylene-, and p, p'-diphenylene - bis-dithiocarbamic acids with metals were obtained: divalent nickel, zinc, and cobalt, and monovalent copper. It was shown that when divalent salts of copper react with disodium salts of bis-dithiocarbamic acids, the copper is reduced to monovalent copper and the sulfur and carbon oxysulfide are released simultaneously, and that a polymer of reticular structure containing copper forms. It was found that very few cyclic structures form in the polychelates of nickel, zinc, and cobalt with ethylene- and hexamethylene-bis-dithiocarbamic acids. The molecular weight of the polymers of nickel and zinc was determined by the radioactive-tracer method. (Author)

AD-602 225 Div. 4
OTS Price $0.75

Washington Univ., Seattle.
IODINE FLUOROSULFATES AND IODYL FLUOROSULFATE.
Technical rept. nos. 47 and 48,
by Friedheim Aubké, George H. Cady, and C. H. L. Kennard. 1964, 30p
Contract Nonr477 16, ARPA Order 26 60, Task 2
Unclassified report

Descriptors: (*Iodine compounds, Synthesis (Chemistry)), (*Fluorine compounds, Synthesis (Chemistry)), (*Sulfates, Synthesis (Chemistry)), Chemical reactions, Chemical properties, Colors, Spectra (Visible and ultraviolet), Ions, Iodine.

Iodine (I) fluorosulfate (IOSO2F) and tri-iodine fluorosulfate (I3OSO2F) were prepared by the reaction of iodine with peroxydisulfuryl difluoride (S2O6F2). Their solutions in fluorosulfuric acid have the colors and spectra characteristic of the I(+) and I(3+) ions, respectively. Dichlorofluorosulfatoiodine (IC12OSO2F) was produced from chlorine and IOSO2F. Iodine (III) fluorosulfate decomposes slowly when under vacuum at about 80 degrees to 90 degrees to give iodine (I) fluorosulfate, which remains with the unreacted I(OSO2F)3, and the volatile products SO3, IF3(OSO2F)2 and an unidentified substance which may be I(OSO2F)5. (Author)

AD-602 227 Div. 4
OTS Price $0.75

Uppsala Univ. (Sweden).
A FLASH PHOTOLYSIS STUDY OF THE PRIMARY REACTIONS IN THE PHOTOSENSITIZED AUTOXIDATION OF TYROSINE.
Special technical and scientific rept. no. 3 (Final),
1 Feb 63-31 Jan 64,
by Volker Kasche. 31 Jan 64, 22p
Contract DA91 591EUC2828
Unclassified report

Rept. on Flash Photolysis Study of the Reactions Between Photoexcited Fluorescein (and Similar Dyes) and Selected Substrates Which are on the one Hand Electron Donors and on the Other Hand Electron Acceptors.

Descriptors: (*Photochemistry, Dyes), (*Dyes, Photochemistry), (*Tyrosine, Photolysis), Amino acids, Spiro compounds, Resorcinol, Bromides, Atomic energy levels, Excitation, Quenching (Inhibition), Oxidation-reduction reactions, Sweden.

Using tyrosine as a substrate, the triplet state of fluorescein and eosin dyes are quenched at about the same rate. It was found that more than 30% of the triplets were quenched in electron transfer reaction with the substrate. Also the ratio of the rate of electron transfer to the rate of energy transfer could be measured and found to be lower for eosin than for fluorescein. From this it can be inferred that the dianionic eosin triplet is a weaker reducing agent than the dianionic fluorescein triplet. No indications of triplet-oxygen complexes were found. (Author)

AD-602 228 Div. 4, 10
OTS Price $7.60

Arizona Univ., Tucson.
THE USE OF GAS-SOLID AND GAS-LIQUID CHROMATOGRAPHY IN COMBUSTION GAS ANALYSIS.
Master's thesis,
by Jose J. Olvera. 1964, 80p
Unclassified report

Descriptors: (*Chromatographic analysis, Gas analysis), (*Combustion chamber gases, Chromatographic analysis), Combustion products, Chemical analysis, Fuels, Hydrogen, Oxygen, Nitrogen, Methane, Carbon dioxide, Carbon compounds, Monoxides, Solids, Liquids, Laboratory equipment.

The primary purpose of the study was to improve gas sampling techniques and to refine the calibration data for the application of the principles of gas chromatography to the analysis of combustion products from The University of Arizona Combustion Tunnel. Combustion products were analyzed and air-fuel ratios were calculated. The secondary purpose of the study was to extend the capability of the existing chromatography apparatus to the detection of selected hydrocarbons of the paraffin and olefin families. It was verified that propane (C3H8) was selectively retained on the original equipment. Established principles and techniques were employed to construct and test chromatographic columns with selective retardation capabilities on the olefins. Pentene (C5H10) and octene (C8H16) were used for this phase of the study. (Author)

AD-602 257 Div. 4, 17
OTS Price $1.50

Rock Island Arsenal Lab., Ill.
THERMAL STABILITY OF NINE HIGH TEMPERATURE FLUIDS AND THEIR INTERMIXTURES.
Technical rept.,
by R. LeMar. 24 Jan 64, 56p
Proj. 1A024401A108
RIAL 64 231
Unclassified report

Descriptors: (*Heat-resistant materials, Stability), (*Fluids, Thermal properties), Borates, Silicones, Siloxanes, Ethers, Silanes, Silicates, Chlorides, Phenyl radicals, Phosphates, Fatty acid esters, Mineral oils, Nitrogen, Aluminum, Copper, Steel, Degradation, Mixtures, High-temperature research, Solubility.

The thermal stability of nine high temperature fluids and their intermixtures was evaluated at 650F for sixteen hours under nitrogen in the presence of a set of four metal specimens consisting of aluminum, copper, steel and monel metal. When each of the nine fluids was tested alone, polyphenyl ether and phenyl methyl polysiloxane displayed outstanding stability. Diphenyl bis-n-dodecyl silane, tetra (2-ethylhexyl) ortho silicate, deep dewaxed-super refined mineral oil and chlorinated biphenyl fluids showed good stability. Tritolyl phosphate, 2-6-ditert butyl 4-methyl phenyl di-n-butyl borate and pentaerythritol-mixed fatty acid ester fluids all displayed severe fluid degradation and, except for the borate, severe metal attack. As regards inter-fluid miscibility, the silane, chlorinated biphenyl, borate and ester fluids showed complete miscibility with all the other fluids tested. Among the fluid intermixtures, twelve displayed good thermal stability. (Author)

Even a partial list of the behavioral variables that could be resonably expected to affect the process and outcomes of a teleconferencing facility would virtually define the field of social psychology; and a list of the customary methods of studying those variables would involve several of the social sciences. Obviously, what is required, at least for the initial period of research, is the selection of a relatively small number of variables -- hopefully, those most immediately relevant to the questions that must be answered about teleconferencing. The purpose of the paper, therefore, is to propose criteria for selecting such a group of variables, and to suggest methods appropriate to their study. (Author)

AD-601 926 Div. 5, 28, 32
OTS Price $0.50

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: LANGUAGE AND CULTURAL FACTORS,
by Edmund S. Glenn. Nov 63, 14p
IDA P109, IDA-HQ-64-2314
Contract SD50

Unclassified report

Descriptors: (*Communication systems, Military communications), (*Language, Communication systems), (*Culture, Communication systems), (*Symposia, Social psychology), Social communication, Documentation, Political science, Networks, Telephone communication systems, Teletype systems, Television communication systems.

The paper discusses the problems of language services and the possible influence language and cultural factors have on the conduct of teleconferences. (Author)

AD-601 927 Div. 5, 8, 18
OTS Price $0.50

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: CAPACITY OF CURRENT COMMUNICATION FACILITIES.
by Jay W. Schwartz. Nov 63, 14p
IDA P110, IDA/HQ-64-2315
Contract SD50

Unclassified report

Descriptors: (*Communication systems, Military communications), (*Telephone communication systems, Communication theory) (*Teletype systems, Communication theory), Networks, Telephone signals, Bandwidth, Signal-to-noise ratio, Telephone equipment, Television communication systems, Costs, Symposia.

The discussion is the result of a cursory investigation into facilities available for teleconferencing between stations situated in any or all NATO capitals. It has a two-fold purpose: (1) to apprise investigators concerned with other aspects of the teleconferencing problem of the available communication facilities; and (2) to guide more comprehensive investigations into the characteristics of available or proposed communication facilities. The discussion is directed toward the reader who is not familiar with communication theory and practices. (Author)

AD-601 928 Div. 5, 8, 32
OTS Price $0.75

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: PROCEDURES.
by Thomas G. Belden. Nov 63, 23p IDA P111,
IDA/HQ-64-2316
Contract SD50

Unclassified report

Descriptors: (*Communication systems, Military communications), (*Teletype systems, Analysis), (*Symposia, Communication systems), Social communication, Communication theory, Language, Networks, Telephone communication systems, Television communication systems.

An attempt is made to suggest a method for analyzing teleconferencing procedures. The method suggested is illustrated by some examples in which many of the variables are fixed. First, certain definitions and symbols are created as a means of conveying the network and procedural alternatives. Second, certain networks are described in general terms by the suggested method. Finally particular networks which have received attention are described by the same method and their procedural issues discussed. In this selection of examples, no recommendations are made of one technique over another. The primary emphasis is on teletype as a communication media since it is the most common and currently practical mode of teleconferencing with security under present world-wide communication conditions. (Author)

AD-601 929 Div. 5, 32
OTS Price $1.75

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: AN EXPERIMENTAL TASK.
Nov 63, 64p IDA P112, IDA/HQ-64-2317
Contract SD50

Unclassified report

Prepared in cooperation with Aircraft Armaments, Inc.

Descriptors: (*Communication systems, Military communications), (*Symposia, Game theory), (*Game theory, Communication systems), Social communication, Political science, Military strategy, Simulation.

A description is given of two games (SUMMIT I and SUMMIT II) designed to provide suitable settings for the investigation of teleconferencing procedures and facilities. A history of the development of the games is included.

AD-601 932 Div. 5, 8, 32
OTS Price $1.50

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: PRELIMINARY EXPERIMENTS.
by H. Wallace Sinaiko. Nov 63, 51p
IDA P108, IDA/HQ-64-2313
Contract SD50

Unclassified report

Descriptors: (*Communication systems, Military communications), (*Symposia, Simulation), (*Teletype systems, Simulation), (*Telephone communication systems, Simulation), Social communication, Language, Game theory, Networks, Television communication systems, Test facilities, Feasibility studies.

As part of the Teleconferencing Project a laboratory facility was set up to enable the project personnel to observe directly a variety of teleconferencing arrangements. Overall objectives of this phase of the study were: (a) to assess the feasibility of laboratory experimentation in a later project on teleconferencing, and (b) to provide direct experience which would assist us in defining problems for later research. The facility, the types of questions posed in the laboratory studies, and the results of these observations are described. (Author)

5. COMMUNICATIONS

AD-601 696 Div. 5, 30
OTS Price $8.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF THE APPLICATION OF CODING THEORY. Final rept.
by Arthur E. Laemmel. 27 Feb 64, 93p, PIBMRI 1206 64
Contract DA36 039sc78972 and Grant AF AFOSR62 295
Unclassified report

Descriptors: (*Coding, Theory), (*Communication theory), (*Digital computers, Computer logic), Design, Synthesis, Binary arithmetic, Matrix algebra, Algebras, Functions, Inequalities, Probability, Errors, Data processing systems, Transducers, Sequences.

This report deals mostly with discrete codes. The codes which are discussed are used principally to compress information into the fewest possible digits, and little attention is given to error-reducing codes. Several other aspects of coding processes beside information-compression are considered, and some coding process results might better be classified under finite state machine theory. Also, some attention has been given to digital computer design and synthesis. It is felt that these fields are closely related not only because apparatus must eventually be made to carry out the encoding and decoding if the code is to be used in practice, but also because the definition of coding process is sufficiently general to describe the sequential transducers found in various parts of informating processing equipment. (Author)

AD-601 807 Div. 5, 12
OTS Price $2.00

Aerospace Corp., Los Angeles, Calif.
MOMENTUM BIAS ATTITUDE CONTROL FOR A SYNCHRONOUS COMMUNICATION SATELLITE,
by A. C. Barker. 30 May 64, 74p TOR-269 4540 70 1
Contract AF04 695 269
Unclassified report

Descriptors: (*Satellites (Artificial), Attitude control systems), (*Communication satellites (Active), Attitude control systems), (*Synchronous satellites, Attitude control systems), (*Attitude control systems, Communication satellites (Active)), Orbital trajectories, Momentum, Solar panels, Pitch (Motion), Roll, Yaw, Space environmental conditions, Gyroscopes, Matrix algebra, Feasibility studies.

The purpose of the study was to establish the feasibility of mechanizing a proposed single-axis control system (momentum bias), and to obtain a set of approximate system design parameters. It is expected that the results will facilitate an evaluation of the single-axis system with respect to other attitude control schemes being considered. Analysis of vehicle dynamic behavior for the various environmental and self-induced disturbances encountered in space is an important part of the study. Results are expressed in both numerical and parametric form. A consequence of the study was the definition of a specific acquisition sequence. Criteria for parameter selection and a specific mechanization were developed; system dynamic response was studied in some detail. (Author)

AD-601 923 Div. 5, 18, 32
OTS Price $0.50

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: FEASIBILITY OF A RESEARCH AND DEVELOPMENT PROGRAM.
by Jesse Orlansky. Oct 63, 13p IDA P105, IDA/HQ-64-2309
Contract SD50
Unclassified report

Descriptors: (*Communication systems, Military communications), (*Telephone communication systems, Feasibility studies), (*Teletype systems, Feasibility studies), Networks, Language, Political Science, Television communication systems, Symposia.

Teleconferencing is a term used to describe conferences held between individuals in locations remote from each other by means of communication facilities such as telephone, teletypewriter and/or television. The problem of interest concerns the equipment and procedures that would be required to insure efficient communications between leaders of allied nations during crisis situations and between leaders of the U. S. and the USSR on the Hot Line. Thus, it is helpful to understand the influence of such factors as the number of participants, communication media, network structure, switching arrangements, language translation requirements, conference procedures, and security considerations upon the efficiency of communications. An examination is made of the feasibility of a research and development program to increase our competence in the area of teleconferencing. (Author)

AD-601 924 Div. 5, 28, 32
OTS Price $0.75

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: BACKGROUND INFORMATION.
by Alex Bavelas. Nov 63, 22p
IDA P106, IDA/HQ-64-2310
Contract SD50
Unclassified report

Descriptors: (*Communication systems, Military communications), (*Symposia, Social psychology), (*Social communication, Symposia), Networks, Telephone communication systems, Teletype systems, Television communication systems, Mathematical models, Topology, Group dynamics, Communication theory, Statistical analysis.

The background information for a study of teleconferencing may be listed under three headings: (1) teleconferencing per se, (2) traditional face-to-face conferences, and (3) social and psychological processes said to occur in conferences. Each of these three categories is explored briefly in order to assess the value of a more thorough search. Findings and recommendations are given under each heading. (Author)

AD-601 925 Div. 5, 28, 32
OTS Price $0.50

Institute for Defense Analyses, Washington, D. C.
TELECONFERENCING: GUIDELINES FOR RESEARCH.
by Alex Bavelas. Nov 63, 10p
IDA P107, IDA/HQ-64-2312
Contract SD50
Unclassified report

Descriptors: (*Communication systems, Military communications), (*Symposia, Social psychology), (*Social communication, Symposia), Scientific research, Communication theory, Networks, Telephone communication systems, Teletype systems, Television communication systems, Group dynamics.

training. Operational information and test data obtained at the STF are used in planning and development of the 465L System. Specific activities reported included continuation of the investigation of problems related to the Motorola Printer and Translator, and group display projection background and character brightness variations. (Author)

AD-602 295 Div. 5, 16, 25
OTS Price $1.50

Royal Inst. of Tech., Stockholm (Sweden).
SPEECH TRANSMISSION LABORATORY QUARTERLY PROGRESS AND STATUS REPORT.
Rept. for Oct-Dec 63.
15 Jan 64, 56p KTH STL-QPSR4/1963
Contract DA91 591EUC3080; Grant AF EOAR63 55
AFCRL 64 262

Unclassified report

Descriptors: (*Speech transmission, Analysis), (*Auditory perception, Speech), (*Acoustics, Music), (*Earphones, Deafness), Hearing, Sound, Touch, Spectrum analyzers, Verbal behavior, Coding, Digital computers, Analog computers, Data storage systems, Sweden.

Contents: speech analysis, speech perception, musical acoustics, and aids for the deaf and hard of hearing.

Division 5 - COMMUNICATIONS

AD-301 970 Div. 5, 8
OTS Price $0.50

Naval Research Lab., Washington, D. C.
MICROELECTRONIC VIDEO DRIVER UNIT REPORT.
by J. A. Helton. Apr 64, 16p
Proj. SF007 05 01 6046
NRL MR1529

Unclassified report

Descriptors: (*Video amplifiers, Performance (Engineering)), (*Miniature electronic equipment, Video amplifiers), Gain, Video signals, Noise (Radar), Attenuation, Test equipment (Electronics).

To demonstrate the electrical and physical advantages of microelectronic video amplifiers, the Microelectronic Video Driver Unit has been developed. It performs the same functions as the Navy's AM-1914/UP Video Amplifier as a video distribution unit. Tests performed on the Microelectronic Video Driver Unit indicate it offers considerable advantages as a replacement for the AM/1914/UP in size, weight, power consumption, electrical performance, and potential reliability. (Author)

AD-602 003 Div. 5, 8
OTS Price $9.60

Moore School of Electrical Engineering, Univ. of Pennsylvania, Philadelphia.
SYSTEM STUDY FOR SUPER MOBILE COMMUNICATIONS SATELLITE GROUND STATION.
Quarterly rept. no. 3, 1 Jan-31 Mar 64
by F. Haber, M. Akiyama, K. Ya'Coub, J. Feld, and R. Moff. 30 Apr 64, 118p MSEE 64 15
Contract DA36 039AMC03219E, Proj. 1R3 32 101 D253

Unclassified report

Descriptors: (*Space communication systems, Communication systems), (*Ground support equipment, Space communication systems), Mobile, Systems engineering, Pulse modulation, Analysis, Antennas, Microwave equipment, Tracking, Satellites (Artificial).

The work included analyses of certain digital modulation systems which are potential competitors to the analog systems reviewed earlier, analysis of antenna noise, further development of antenna array systems, a development of a method for field calculation of antenna pointing directions, and a survey of existing and potential low noise receiving systems. The modulation studies indicate that only scant improvement over the capability of angle modulation feedback techniques are possible with digital systems - assuming the published results on the former are correct. The conclusion is based on analyses carried out on several multistate PCM transmission systems. One of these, using a weighted pulse duration, the weighting being dependent on the significance of the information represented by the pulse does not appear to have been studied before. It gave better results than a single error coded system, a deltasigma system, and of course, an unweighted system. (Author)

AD-602 028 Div. 5, 12
OTS Price $1.75

General Dynamics/Convair, San Diego, Calif.
INITIAL DEVELOPMENT OF A MINIATURIZED TELEMETERING PACKAGE FOR DATA ACQUISTION AT HIGH SPEED WATER ENTRY.
by R. M. Hopkins. Apr 64, 61p GDC 64 108
Contract NOw60 0494d

Unclassified report

Descriptors: (*Telemeter systems, Accelerometers), (*Guided missiles, Water entry), Instrumentation, Miniature electronic equipment, Transistors, Transducers (Acoustic), Guided missile launchers, Guided missile models, Arresting gear, Water tanks, Telemetering data.

The shock due to high speed water entry of a body may easily reach several thousand g's, and cause serious structural damage. A telemetry package is needed which will accurately measure these accelerations. The report summarizes the approach, problems, and results of a program to develop a miniaturized self-contained telemetry system for measuring the accelerations due to water entry velocities of up to 1000 feet per second. (Author)

AD-602 063 Div. 5, 18, 30
OTS Price $2.50

International Electric Corp., Paramus, N. J.
STRATEGIC AIR COMMAND CONTROL SYSTEM (465L).
Monthly test progress rept. no. 33, 21 Feb-20 Mar 64
by W. J. Ernst. 20 Apr 64, 102p IEC 20130
Contract AF19 626 8
ESD TDR64 324

Unclassified report

Descriptors: (*Communication systems, Strategic Air Command), (*Strategic Air Command, Communication systems), (*Command and control systems, Strategic Air Command), Combat information centers, Data transmission systems, Data processing systems, Display systems, Integrators (Computers), Remote control systems, Ground support equipment, Management engineering, Systems engineering, Performance (Engineering), Performance (Human), Programming (Computers).

Information is presented concerning each milestone established in the 465L System Test Plan. The milestone information is organized generically by Centrals and other descriptive titles for activities of similar scope. These, in turn, are consolidated according to subsystem and comparable collective designations. Testing not attributable to the 465L System Test Plan Milestones are reported in paragraphs associated with their related test activities. The System Test Facility (STF) located at the Contractor's Project Headquarters supported demonstrations, special tests and

AD-602 130 Div. 5, 6, 30
OTS Price $1.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE ORTHOMATCH DATA TRANSMISSION SYSTEM,
by B. G. Kuhn. 18 Feb 64, 62p LL TR346
Contract AF19 628 500
ESD TDR64 35

Unclassified report

Descriptors: (*Data transmission systems, Performance (Engineering)), (*Telemeter systems, Performance (Engineering)), Communication systems, Pulse modulation, Frequency modulation, Communication theory, Space-to-surface, Digital systems, Signal-to-noise ratio.

Orthomatch is a high-performance data transmission or telemetry system which uses envelope-orthogonal signals in the transmitter and matched-filter detectors in the receiver. Because of the parallel coding and optimum detection techniques of Orthomatch, its calculated performance equals or betters the calculated performance of other available telemetry systems. It is within 10.2 db of Shannon's ideal system. A practical Orthomatch system, operating with 16 levels of amplitude resolution and a 40-kcps word rate (160-kcps bit rate), has been assembled in field-prototype form and tested with transmitter and receiver components at 2.22 Gcps. Signal-in-noise performance of this practical system was found to be within 1.5 db of calculated performance. High performance at low signal levels and other advantages of Orthomatch make it attractive for use at high data rates in space-to-ground or other transmission links where transmitter power is at a premium. (Author)

Information matrices are derived for estimates of the range parameters of moving targets as obtained by combining apriori information (if available with reflected radar signals observed in the presence of additive white Gaussian noise. The inverse of the information matrix provides a lower bound on the covariance matrix of any unbiased parameter estimates. This bound can be approached with a high signal-to-noise ratio and optimum data processing (matched filters). Arbitrary frequency modulation, amplitude modulation and target motion as well as various assumptions on processing the R-F phase are considered. The multiple target case enables investigation of a signal's resolution ability as well as its accuracy potentials. Results for a carrier frequency much greater than the effective signal bandwidth are obtained as a special case. A main purpose of the report is the reduction of the original radar problem to a linear model which is equivalent in the sense of having the same information matrix. The various special cases of interest are obtained by simple modifications of the general case and thus the algorithm can provide a very versatile tool for evaluating and designing radar signals. (Author)

AD-601 999 Div. 6, 5, 8
OTS Price $2.25

Raytheon Co., Portsmouth, R. I.
ADAPTIVE DETECTION OF STATISTICAL SIGNALS IN NOISE.
Technical rept.,
by H. L. Groginsky, L. R. Wilson, and D. Middleton.
Jun 64, 90p, Ray R339
Contract Nonr3381 00, Proj. NR187 202

Unclassified report

Rept. on Statistical Communication Theory in Sonar.

Descriptors: (*Detectors, Signal-to-noise ratio), (*Communication theory, Statistical processes), Detection, Correlators, Signals, Noise, Statistical functions, Sampling, Population (Mathematics), Simulators, Digital computers, Sonar, Adaptive communication systems.

The forms and properties were studied of a detector designed to operate in an environment in which little statistical information about either the signal or noise field is or can be available. An adaptive detector based on the theory of nonparametric statistics has been designed for this purpose. The detector uses amplitude samples taken from two distinct receivers, only one of which may contain signals from a target. The detector is shown to maintain constant false alarm rate despite any nonstationarity of the noise. (Author)

AD-602 121 Div. 6
OTS Price $2.25

Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
MARCUM'S AND SWERLING'S DATA ON TARGET DETECTION BY A PULSED RADAR.
by L. F. Fehlner. 2 Jul 62, 88p TG-451
Contract NOw62 0604c

Unclassified report

Descriptors: (*Target discrimination, Radar targets), (*Radar pulses, Detection), Noise (Radar), Signal-to-noise ratio, Gain, Pulse integration, Data, Electronic equipment, Performance (Engineering), Probability, Equations, Statistical analysis, Ranges (Distance), Special functions.

Marcum has produced a definitive treatment of the statistical problem of target detection by a pulse radar. The text and graphs of Marcum's papers are presented in terms so highly mathematical that his results may not appear as useful as they really are. The purpose of this memo is to describe the problem that Marcum solved and to present graphs of more extensive and more accurate computed data in a form which may prove more useful for most applications. Nothing new is added from the statistical viewpoint. Those interested in the mathematical development are referred to Studies of Target Detection by Pulsed Radar, IRE Transactions Volume IT-6, No. 2, April 1960.

AD-602 141 Div. 6, 8
OTS Price $1.00

Army Electronics Research and Development Agency Fort Monmouth, N. J.
ENGINEERING TEST OF X-BAND MASER FOR WEATHER RADAR SET AN/MPS-34,
by Raymond L. Robbiani. Mar 64, 33p
Task 1AO 25001A126 03
AELRDL TR2427

Unclassified report

Descriptors: (*Radar equipment, Sensitivity), (*Meterological radar, Masers), (*Masers, X band), Microwave amplifiers, Helium, Theory, Tests, Radar signals, Detection, Noise (Radar), Radar antennas, Radar targets, Storms, Atomic clouds, Meterological satellites.

An engineering test was performed to determine the increase in sensitivity that an X-band helium maser could afford a Radar Set AN/MPS-34. The maser increased sensitivity by 12.5 db. Radar sensitivity improvement suggests many prospects for future uses in nuclear-weather surveillance. These include improved meteorological intelligence and satellite operations. Future plans are explored. Photographs show a comparison in storm detection of Radar Set AN/MPS-34 with and without maser amplification. (Author)

AD-602 213 Div. 6
OTS Price $2.00

Lansdale Div., Philco Corp., Pa.
PEM FOR GOLD-DOPED GERMANIUM INFRARED DETECTOR TYPE IR400.
Quarterly progress rept. no. 5, 27 Dec 63-27 Mar 64,
by A. Guimento. 27 Mar 64, 74p Philco H-200
Contract DA36 039AMC01464E

Unclassified report

Descriptors: (*Infrared detectors, Production), Manufacturing methods, Quality control, Germanium, Gold, Barium compounds, Fluorides, Infrared windows, Machine tools, Tests, Experimental data.

Work was concentrated on fabricating and testing six engineering samples which had barium fluoride windows and sensitive areas 1/2 mm x 1/2 mm. The change in sensitive area from 2 mm x 2 mm, authorized during the fourth quarter, required additional engineering effort beyond that completed under the original provisions of the contract. Work was continued on the Inspection and Quality Control Plan and the Equipment Requirements and Production Rates data. The preproduction phase of the contract was started during this period. Considerable effort was expended on improvement of existing tooling to be used with an optical comparator to assure proper alignment of the cell. Detailed test data on the six engineering samples delivered are included in the appendix to this report. (Author)

AD-602 242 Div. 6, 8
OTS Price $0.75

Anti-Submarine Warfare Lab., Naval Air Development Center, Johnsville, Pa.
RESEARCH SONOBUOY CONFIGURATION (RESOC) R AND D CONTAINER NO. 1.
Final rept.,
by J. Weber. 1 Jun 64, 28p
NADC-AW 6415

Unclassified report

6. DETECTION

AD-601 733 Div. 6, 8
OTS Price $1.00

Harry Diamond Labs., Washington, D. C.
ANALYSIS OF THE SPIRAL ANTENNA DIRECTION FINDER.
by Peter B. Johnson. 20 Apr 64, 40p
Proj. 26100
HDL TR-1221

Unclassified report

Descriptors: (*Direction finding, Spiral antennas), (*Spiral antennas, Direction finding), Mathematical analysis, Antenna radiation patterns, Errors, Azimuth, Electromagnetic waves, Design, Phase measurement, Theory, Experimental data.

A study was made of a method previously suggested for constructing a passive direction finder capable of determining the azimuth and elevation of an electromagnetic wavefront. This direction finder consists of a two-wire, Archimedian, spiral antenna and a phase comparator. Angular information of accuracy too low for the intended application is obtained when the theory and experimental data previously presented are used. A general theory for the direction finder is established and methods for accuracy improvement are suggested. (Author)

AD-601 856 Div. 6, 2, 30
OTS Price $0.75

Aerospace Corp., Los Angeles, Calif.
ORBIT DETERMINATION BY ANGULAR MEASUREMENTS.
by P. O. Bell. 29 Jan 64, 24p, TDR269 4550 10 3
Contract AF04 695 269
SSD TDR63 359

Unclassified report

Descriptors: (*Celestial mechanics, Equations), (*Orbital trajectories, Measurement), (*Satellites (Artificial), Orbital trajectories), Azimuth, Tracking, Numerical analysis, Computers, Vector analysis.

From a tracking station of known geocentric location, the measurements of the azimuth and elevation of a satellite at three instants of time provided tracking data sufficient for a preliminary determination of the orbit of the satellite about the earth. From such data, the components (in a geocentered inertial coordinate system) of the position vectors of the satellite may be calculated and in terms of these components, all of the orbital elements may be expressed. In view of the given positional data of the tracking station and the directional data of the satellite's position, only the slant ranges are needed to complete the determination of the vectors. To solve for the slant ranges, an iterative procedure was introduced whereby successive systems of linear equations are solved. Subsequently, all of the orbital elements were easily computed.

AD-601 888 Div. 6, 25
OTS Price $1.00

Institute of Science and Tech., Univ. of Michigan, Ann Arbor.
RESOLUTION CAPABILITIES OF OFF-AXIS DETECTOR ELEMENTS IN PARABOLOIDAL OPTICAL SYSTEMS,
by William L. Brown. Jun 64, 40p IST 2900 475T
Contract DA36 039sc78801

Unclassified report

Report on Project Michigan.

Descriptors: (*Infrared optical systems, Resolution), (*Optical equipment, Infrared equipment), Parabolic bodies, Infrared detectors, Focusing, Optical scanning, Light, Sources, Optical properties, Equations, Programming (Computers), Infrared research, Mathematical analysis.

This report presents a new approach to the optical analysis of infrared detection systems, which avoids the ambiguous nature of spot diagrams. By analyzing an ideal paraboloidal optical system, a unique equation is derived which can be used to determine how much light, emitted from a point source and incident upon the collecting aperture, is actually focused upon a given detector. The alignment of a detector element both along the optical axis (focusing) and normal to the optical axis (centering) is shown to be critical. The IBM 704 digital computer was used to obtain numerical results which show that a maximum of 9 elements can be used with an f/1 system. This is true regardless of the size of the individual elements, since the distance to the outer element increases linearly with element size and the optical defects increase linearly with distance off axis. The computation results were then applied to a real system in order to show the effects of optical defects upon the dynamic resolution of a scanning system. (Author)

AD-601 982 Div. 6, 5, 8
OTS Price $1.25

Electrical Engineering Research Lab., Cornell Univ., Ithaca, N. Y.
ADAPTIVE RECOGNITION OF RANDOM BINARY SIGNALS.
Technical rept. no. 80
by G. Beine. Jun 64, 45p EERL 7
Contract DA36 039AMC00034E

Unclassified report

Descriptors: (*Communication theory, (Signal-to-noise ratio), (*Signals, Detection), Filters (Electromagnetic wave), Adaptive communication systems, Detectors, Correlators, Optimization, Sequences, Simulation, Programming (Computers).

The problem of this study is the detection of signals that are neither periodic nor of constant waveshape in the presence of white noise. It is assumed that the signals are initially known, that they are of a binary form, that they are modified at random times by the complementing of one randomly chosen bit, and that they occur at random times. An adaptive matched filter based upon the link connection is proposed. The link connection is selected because of the relative simplicity with which it can perform cross-correlations and deliver samples of its input, and because of the large bandwidth it can provide. Several methods for estimating the input-signal waveform from its samples, including finite averaging, finite summation, and RC averaging, are discussed. Miss and false-alarm probabilities for the system are computed, estimated, or bounded, and its general behavior, from initial matching to noise-induced failure, is described. A digital computer program for the simulation of the adaptive system is described with flow charts. (Author)

AD-601 986 Div. 6, 8
OTS Price $1.25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE ACCURACY AND RESOLUTION OF RADAR SIGNALS.
Group rept.
by F. C. Schweppe. 25 Jun 64, 44p LL 1964 23
Contract AF19 628 500
ESD TDR64 343

Unclassified report

Descriptors: (*Radar signals, Communication theory), (*Communication theory, Radar signals), Radar reflections, Resolution, Modulation, Noise (Radar), Radar targets, Mathematical models, Linear systems, Matrix algebra.

7. ELECTRICAL EQUIPMENT

AD-601 714 Div. 7
OTS Price $2.25

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ELECTROMECHANICAL PULSERS.
Apr 64, 95p PIBMRI 1138 63
Contract AF30 602 2149, Proj. 4506, Task 450603
RADC TDR63 436
Unclassified report

Descriptors: (*Pulse generators, Feasibility studies), (*Power supplies, Modulation), Pulse modulation, Generators, Energy conversion, Armatures, Coils, Winding, Electromagnetic shielding, Voltage, Modulators, Mathematical analysis, Radar, Radar transmitters.

The feasibility of the generation of short pulsed D. C. power by means of electromechanical energy conversion was investigated. A two-coil primitive system is analyzed and the effect, on the output of a third short circuited coil closely coupled to the excitation winding, was studied both with respect to the pulse magnitude as well as the pulse shape. From the results obtained, a shielding scheme was developed and the basic electromechanical pulser evolved; the main feature of the developed pulser being a conducting cylinder surrounding the armature. The conducting cylinder accomplished the dual purpose of shielding the armature from the main pole iron, resulting in a drastically reduced armature self-inductance as well as shielding the excitation circuit from the effects of the armature reaction, thus making the excitation circuit, in effect, current source driven. (Author)

AD-601 817 Div. 7, 12
OTS Price $2.00

Westinghouse Electric Corp., Pittsburgh, Pa.
CEROLYTE FUEL CELL.
Quarterly technical progress rept. no. 1
by D. H. Archer, E. F. Sverdrup, L. Elikan, W. A. English, and R. L. Zahradnik. 1964, 72p
Contract AF33 615 1425; continuation of Contract AF33 657 8251
Unclassified report

Descriptors: (*Fuel cells, Spacecraft), (*Power supplies, Fuel cells), Electrodes, Platinum, Bonding, Surface properties, Solids, Electrolytes, Ceramic materials, Zirconium compounds, Oxides, Voltage, Batteries and components, Performance (Engineering), Hydrogen, Oxygen, Seals (Stoppers), Resistance (Electrical), Polarization, Vaporization, Tests.

This work is to gain the theoretical and practical information on solid electrolyte -- cerolyte -- hydrogen-oxygen fuel cells necessary to the construction of a power plant for space A 50-watt cerolyte battery will be constructed and a 500-watt fuel-cell power plant will be designed. Research and development work is devoted to producing rugged, long-lived, efficient, electrodes and seals. The program as a whole is divided into four parts: 1) electrode development; 2) seal development and battery testing; 3) design, construction, and testing of a 50-watt power system; and 4) design and evaluation of a 500-watt cerolyte fuel-cell power system for space. During the first quarter work has been concentrated in the first two areas.

AD-601 854 Div. 7, 24
OTS Price $1.00

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
PHOTOGRAPHIC RECONNAISSANCE TERRAIN ILLUMINANTS.
Interim engineering rept.,
by P. Bruce Newell and David V. Turnquist. 10 Jun 64, 31p
EGG B2829
Contract AF33 657 11327, Proj. 6220, Task 622005
Unclassified report

Descriptors: (*Xenon lamps, Design), (*Illumination, Photographic reconnaissance), Electric arcs, Electrodes, Heat transfer, Cooling, Gas flow, Argon, Nitrogen, Circuits, Lighting equipment, Feasibility studies.

Based on the technical discussion of arc sources presented in EG and G Report No. B-2566, this task involves determining the feasibility of designing a compact arc lamp that is capable of reasonable life with continuous operation at 6 kilowatts and which is cooled by high velocity injections of the fill gas into the arc discharge area (direct contact - convection - rather than the standard conduction cooling).

AD-601 906 Div. 7
OTS Price $1.00

Radio Corp. of America, Lancaster, Pa.
THE DEVELOPMENT OF A LOW-TEMPERATURE CYLINDRICAL THERMIONIC GENERATOR.
Quarterly technical rept. no. 1, Mar-Jun 64.
Jun 64, 39p
Contract AF33 615 1547; continuation of Contract AF33 657 8005, Proj. 8173, Task 817305 9
Unclassified report

Descriptors: (*Energy conversion, Thermionic converters, (*Thermionic converters, Design), Electric power production, Heaters, Liquid metals, Cesium, Molybdenum, Helium group gases, Injection, Thermal radiation, Tests.

The specific objectives of the program include: evaluation of existing samples; design and evaluation of improved modules; investigation of low-work-function collectors; investigation of high-temperature collector operation; and investigation of the effects of inert gas injection. The first three months of work covered the analysis of prior failures (See AD-436 806), a continuation of life testing to more than 4300 hours, and the initial design for an improved module. A control standard converter was fabricated for the investigation of low-work-function collectors. One sample collector material was evaluated. A converter design, A-1195, was modified for high-temperature operation, and one converter employing a molybdenum emitter and molybdenum collector was fabricated. (Author)

AD-601 912 Div. 7, 4
OTS Price $0.75

Naval Ordnance Lab., Corona, Calif.
CHEMOELECTRIC ENERGY CONVERSION FOR NON-AQUEOUS RESERVE BATTERY SYSTEMS.
Quarterly rept., for Jan-Mar 64
15 May 64, 25p
NAVWEPS 8193
Unclassified report

Descriptors: (*Energy conversion, Electrochemistry), (*Batteries and components, Electrochemistry), (*Electrolytic cells, Electrochemistry), Eutectics, Magnesium, Potassium compounds, Sodium compounds, Ammonium compounds, Thiocyanates, Uranium compounds, Oxides, Carbon, Nickel, Electrolytes, Electrodes, Lithium alloys, Nitrobenzenes, Free radicals, Ammonia.

Descriptors: (*Radio sono buoys, Containers), (*Containers, Watertight fittings), Antisubmarine warfare, Sonar equipment, Underwater equipment, Buoys, Electrical equipment, Radio equipment, Performance (Engineering), Environmental tests.

A watertight container to be used in the evaluation of sonobuoy components has been developed and evaluated. The container is large enough to minimize packaging difficulties, yet small enough to permit easy handling under all operational conditions. The container is not designed for air-launching, but will function as a normal sonobuoy in the water. Ancillary equipment includes rechargeable battery and battery charging unit. (Author)

AD-602 248 Div. 6, 8
OTS Price $0.75

Rome Air Development Center, Griffiss AFB, N. Y.
WIDEBAND, HIGH GAIN, VARIABLE TIME DELAY TECHNIQUES FOR ARRAY ANTENNAS,
by John B. Payne, III. Jun 64, 26p
Proj. 4506, Task 450601
RADC TDR64 218

Unclassified report

Descriptors: (*Radar antennas, Delay lines), (*Delay lines, Radar antennas), Radar equipment, Antenna components, Broadband, Gain, Electron beams, Digital systems, Electronic switches, Time-delay relays, Amplifiers, Radar scanning.

The report discusses two improved techniques for obtaining a wideband, high gain, nondispersive, variable time delay device to steer array antennas. The first time delay technique uses two wideband helix structures separated by a cylindrical drift tube to obtain a variable delay of 20 or more nanoseconds with a gain of 20 to 30 db. A variable delay is obtained by controlling the beam velocity through the drift region by varying the drift tube potential. Gain variation is minimized by maintaining constant beam velocity through the helices. The second method is a digital technique in which different time delay elements are switched into the signal path. In this technique, each switch is replaced by a wideband amplifier that determines the system bandwidth (200 to 800 mc). (Author)

AD-602 280 Div. 6, 2, 25
OTS Price $0.75

Pacific Missile Range, Point Mugu, Calif.
CORRECTION OF NEAR-HORIZONTAL RADAR ELEVATION ANGLES FOR ATMOSPHERIC REFRACTION,
by L. T. Bankston and D. B. Meeker. 6 Jul 64, 28p
PMR TM64 6

Unclassified report

Descriptors: (*Atmospheric refraction, Radar tracking), (*Radar interference, Corrections), Position finding, Errors, Atmosphere, Refractive index, Electromagnetic waves, Propagation, Distortion, Measurement, Radar equipment, Transponders, Refractometers, Radiosondes.

AN/FPS-16 radars at Point Mugu, San Nicolas Island, and Tranquillon Peak, California, observed the variability with time and space of the position parameters (mostly elevation angle) of a fixed transponder beacon on Santa Cruz Island, California. Soundings with an airborne refractometer were taken along the Point Mugu-Santa Cruz Island path, and radiosondes were released at Point Mugu, while radars at Point Mugu collected elevation angle observations. A ray-trace computer program operated on the sounding data to compute predicted elevation angles at the radar. Observed and predicted angles were compared. It was concluded that errors in the observed elevation angles were due mainly to atmospheric refraction. Also, it was concluded that the variability with time and space of propagation conditions make the slowly acquired and inaccurately positioned sounding data inadequate to achieve corrections commensurate with the inherent accuracy of the AN/FPS-16 radar. If accurate low-angle position data are required, methods other than soundings with aircraft-borne refractometers and balloon-borne meteorological sensor packages should be sought and developed. (Author)

Descriptors: (*Metal seals, Brazing), (*Electric wire, Metal seals), High temperature research, Aeronautics, Ceramic materials, Aluminum, Magnesium, Oxides, Voltage, Oxidation, Tests, Cleaning, Test equipment, Cooling, Electric insulation, Vacuum apparatus.

A brazing study was undertaken to produce reliable end seals for power wire systems. The best results were obtained with 99.5 percent dense alumina end plugs, vacuum brazed under controlled heating, cooling, and cleaning conditions. Studies of the breakdown during the 2000F - 1200v test showed that breakdown occured over the surface of the ceramic. Small modifications of the present end seal configuration using materials already on hand show promise of overcoming this difficulty. (Author)

AD-602 216 Div. 7, 8
OTS Price $1.00

George Washington Univ., Washington, D. C. School of Engineering and Applied Science.
TWO-PORT FORMULATION OF ELECTROMECHANICAL TRANSDUCERS.
Rept. no. 1,
by Louis de Pian and Robert M. Moore. 10 Jul 64, 36p
Contract Nonr761 09, Proj. NR185 550
Unclassified report

Descriptors: (*Transducers, Electromechanical converters), (*Electromechanical converters, Theory), Voltage, Networks, Taylor's series, Electrical impedance, Differential equations, Integral equations, Polynomials, Functions, Integral transforms, Analysis.

The report begins with a discussion of analogies as they pertain to electromechanical transducers. Following this discussion, the linear operating equations of the general transducer are formulated as matrix equations, and the various possible matrix parameters and equivalent networks for such devices are presented. The concepts of reciprocity, nonreciprocity, and antireciprocity are then introduced and their significance is discussed. Finally, a general development of the salient properties of linear electromechanical transducers, including natural (transient) and forced (steady state) response behavior, is developed and the techniques are illustrated. (Author)

AD-602 258 Div. 7
OTS Price $4.00

Inland Testing Labs., Dayton, Ohio.
ALKALINE BATTERY EVALUATION.
Semi-annual rept. no. 4, Apr 62-15 Mar 64,
by W. W. Clark, W. G. Ingling, I. F. Luke, and E. A. Roeger, Jr.
May 64, 290p
Contract AF33 657 8450, Proj. 8173, Task 817304 9
APL TDR64 65
Unclassified report

RTD TDR63 4144 superseded, AD-429 135 superseded, ASD TDR63 394 superseded, AD-411 245 superseded, ASD TDR62 893 superseded, AD-291 477 superseded, ASD TDR62 553 superseded, AD-278 647 superseded, ASD TDR62 68 superseded, AD-273 688 superseded, ASD TR61 236 superseded, AD-267 051 superseded, N63 10422 superseded, N64 12325 superseded, and N64 14962 superseded.

Descriptors: (*Batteries and components, Spacecraft), (*Alkaline cells, Performance (Engineering)), Environmental tests, Silver, Cadmium, Zinc, Nickel, Radiation damage, Voltage, Space environmental conditions, Storage batteries, Failure (Mechanics).

The purpose of this program is to establish a broadbase of battery test data for use in the design of the electrical system of future space vehicles, and to determine the actual failure mechanism of new battery systems under varying environmental and cycle-life conditions. Another objective is to determine techniques and/or materials to prevent these failures, and to increase the usable watt-hours-per-pound capability and cycle life of the battery. This program includes the cycle-life performance evaluation and failure analysis of the following types of sealed, secondary, alkaline cells: two types of 25 ampere-hour silver-zinc cells; one type of 15 and one type of 20 ampere-hour silver-cadmium cells; and one type of 20 ampere-hour nickel-cadmium cell. The program also includes a study of the effects of radiation upon each type of alkaline cell. (Author)

AD-602 276 Div. 7, 4
OTS Price $3.60

Pennsylvania State Univ., University Park. Mineral Industries Experiment Station.
THE SIMPLE-PORE AND THIN-FILM MODELS OF POROUS GAS DIFFUSION ELECTRODES.
Rept. no. 7,
by L. G. Austin, Mario Ariet, Robert D. Walker, Gwendoline B. Wood, and Raymond H. Comyn. May 64, 38p
Contract DA49 186 502ORD917
Unclassified report

Descriptors: (*Electrodes, Fuel cells), (*Fuel cells, Electrodes), Gases, Diffusion, Models (Simulations), Electrolytes, Transport properties, Electric currents, Electrochemistry, Equations, Mathematical analysis.

Two physical models for the mode of operation of porous gas diffusion electrodes for fuel cells are discussed. For non-wetted electrodes the simple-pore model is proposed, in which reactant gas dissolves in electrolyte and diffuses to the submerged electrode surface near the three phase boundary of solid-liquid-gas. It is shown that for normal gas solubilities and diffusion coefficients, this model will lead to low mass transport limited currents unless the pore diameter is less than about 1 micron. For wetted double-layer structure electrodes the thin-film model appears reasonable on the basis of experimental observation. An approximate mathematical treatment of this model leads to useful simple solutions, which can form the basis for design of experiments to test the model. (Author)

Experimental cell studies in the ionic melt system Mg/KSCN-NaSCN-kaolin/UO3-electrolyte-C/Ni were completed. New studies, which include electrical conductivity, polarography, and chronopotentiometry, were begun on electrolytes with dimethyl sulfone solvent (m.p. 109C). Electrode reaction studies of nitrobenzene in neutral liquid ammonia electrolytes indicate the formation of a phenyl NO2 negative radical with a half-life of approximately half an hour, which can be expected to influence short-life battery discharge performance. Liquid ammonia hardware cells with Mg/ metadinitrobenzene (mDNB) electrodes 1 sq cm in area were tested at 25C. The best performance was obtained from Mg/KSCN/NH4SCN-mDNB-C/Ag cells at 25C, which averaged 2.12 volts peak, with a 10% drop during a 5-min discharge into a constant 100-ohm load (21 ma/sq cm peak cursity). (Author)

AD-601 946 Div. 7, 8
OTS Price $0.50

Harry Diamond Labs., Washington, D. C.
A SMALL, ULTRASTABLE, TRANSISTOR-REGULATED MULTIVOLTAGE POWER SUPPLY.
by Floyd Allen and H. J. Reed. 1 Jun 64, 18p
Projs. 1B242403D232, 60400
HDL TR1231

Unclassified report

Descriptors: (*Power supplies, Microwave equipment), (*Transistors, Voltage regulators), Direct current, Amplifiers, Avalanche diodes, Circuits, Batteries and Components, Voltage, Design, Performance (Engineering).

A transistor-regulated multivoltage power supply has been designed to power a microwave transmitter. A battery voltage of 32 ± 5 v is regulated, then transformed and rectified to yield outputs of 1000, 160, and 2.5 v. The outputs are adjustable over the ranges ± 4, ± 6.25 and + 0, - 20 percent, respectively. The stability of the outputs for constant loads and input voltage variations of ± 5 v is better than ± 0.2, ± 0.625, and ± 1.0 percent, respectively. The power supply maintains this stability over a temperature range of -54C to +75C. Two of the output voltages are completely isolated from the input. (Author)

AD-601 965 Div. 7
OTS Price $2.75

Army Engineer Research and Development Labs., Fort Belvoir, Va.
ENGINEERING REPORT OF A 5-HP, ULTRA-HIGH-SPEED INDUCTION MOTOR.
Technical rept.
by Dietrich J. Roesler. 10 Apr 64, 125p
Task 1D622001A01201
AERDL 1772TR

Unclassified report

Descriptors: (*Induction motors, Feasibility studies), Electric motors, High frequency, Velocity, Design, Construction, Performance (Engineering).

This report covers the design, fabrication, testing, and evaluation of a 5-hp, ultra-high-speed (UHS) squirrel cage motor, which was built in accordance with the concepts and design requirements developed under this USAERDL program. The primary goal of the program was to prove the feasibility of building lightweight motors capable of operating at high frequencies and high speeds. The work resulted in a comprehensive method of performance prediction for squirrel cage induction motors up to a frequency of 3,500 cycles. It was concluded that: (a) The use of high frequency and high speeds in the field of electric machinery will result in very small and lightweight machines. (b). The performance of the UHS machine can be brought up to a standard where it can compete with commercial machines. (c) The mechanical problems connected with the high rotor speeds can be solved by proper design and selection of materials. (Author)

AD-602 021 Div. 7, 8, 26
OTS Price $0.50

General Instrument Corp., Garden City, N. Y.
PRODUCTION ENGINEERING MEASURE FOR THE IMPROVED RELIABILITY OF CAPACITORS, FIXED SOLID ELECTROLYTE, TANTALUM HIGH-RELIABILITY 10MFD-20 VOLT CAPACITORS.
Quarterly rept. no. 3, 29 Dec 63-28 Mar 64,
by Floyd R. Banks, Jr. and A. DiGiacomo. 28 Mar 64, 18p
Contract DA36 039AMC03622E

Unclassified report

Descriptors: (*Tantalum capacitors, Manufacturing methods), (*Electrolytic capacitors, Manufacturing methods), Production, Quality control, Reliability, Films, Pyrolysis, Coatings, Carbon, Silver, Dielectrics, Electrical properties, Analysis.

Work was performed in four areas of process improvement studies: (1) anodizing and re-forming; (2) pyrolytic conversion; (3) carbon and silver coating; and (4) screening and dielectric absorption. The major results of the studies show that: (1) new anodizing racks and anodizing cathodes have provided high product uniformity at anodizing and improved electrical characteristics over previous anodizing conditions; (2) conditions of flow and of heat exchange of the conversion atmosphere, and conversion times, have been optimized, based upon the magnitudes of the final re-forming currents; and (3) the best electrical results, based upon comparative studies, have been obtained with three carbon coats applied to the anodes and extended carbon and silver coating curing cycles. (Author)

AD-602 089 Div. 7, 4, 16
OTS Price $1.25

Melpar, Inc., Falls Church, Va.
BIOCHEMICAL FUEL CELL.
Quarterly progress rept. no. 7, 1 Jan-31 Mar 64,
by Paul S. May, G. C. Blanchard, and R. T. Foley.
31 March 64, 43p
Contract DA36 039SC90878, Task 1G6 22001A053 04

Unclassified report

Descriptors: (*Fuel cells, Biochemistry), (*Microorganisms, Fuel cells), (*Gas-generating system, Microorganisms), Energy conversion, Hydrogen, Production, Clostridium welchii, Culture media, Glucose, Metabolism, Buffers, pH.

The report describes an experimental and theoretical investigation of hydrogen production by microorganisms. Studies with a 1/2(2) to the 5th power fractional factorial design experiment were conducted to define the parameters governing the production of hydrogen by Clostridium welchii. Sixteen 10-liter fermenters were used in this study. In addition, the efficiency of substrate conversion and glucose utilization as well as per-cell hydrogen yields were determined. The results indicate that the combination of low buffer, high substrate, high inoculum, and a pH range of 6.3-6.5 provides maximum total hydrogen in 16 hours. (Author)

AD-602 144 Div. 7, 1
OTS Price $0.75

Melpar, Inc., Falls Church, Va.
2000F POWER WIRE FOR AEROSPACE ENVIRONMENT.
Quarterly rept. no. 5, 5 Apr-5 Jul 64.
5 Jul 64, 30p
Contract AF33 657 11046, Proj. 8128, Task 812806

Unclassified report

The study to develop a high order of professional competence in the field of digital sampled-data control systems was continued. A stable, well-behaved plant identification adaptive system was successfully programmed, implemented, and evaluated. The adaptive system had a high rate of convergence, approximately four sample periods, and was able to handle (1) rapidly changing plants, and (2) closed-loop convergence on initially unknown plants. (Author)

AD-601 790 Div. 8
OTS Price $2.00

Microwave Devices Lab., Univ. of Utah, Salt Lake City.
TRAVELING-WAVE TUBES WITH NONPERIODIC DIELECTRIC CIRCUITS.
Technical rept. no. 7,
by Carl H. Durney and Richard W. Grow. 1 May 64, 80p
Contract Nonr1288 05, Proj. NR373 740
Unclassified report

Descriptors: (*Traveling-wave tubes, Circuits), (*Dielectrics, Circuits), (*Circuits, Dielectrics), Waveguides, Power, Propagation, Electrical impedance, Gain, Electric fields, Electron beams, Narrowband, Equations, Numerical analysis.

Dielectric circuits, which in the past have been considered to be unsatisfactory for use as slow-wave circuits in traveling-wave interaction, are analyzed from the traveling-wave approach. The field and power propagation characteristics of the circuits are found using field techniques and the interaction impedance is calculated and averaged to allow for the variation of the electric fields over the region of the electron beam. The gain of the dielectric-circuit traveling-wave tube is calculated and gain characteristics are shown. Essentially four dielectric circuits are treated. Two circuits, a dielectric-coated conductor in a waveguide and an inhomogeneously dielectric-loaded rectangular waveguide, are found to have reasonable gain at X-band, but are very lossy at millimeter wavelengths. The other two circuits, a dielectric tube in a round waveguide and a dielectric plate between two semi-infinite conducting planes, are found to have reasonable gain at 300 Gc. All four circuits are narrow-band and require the electron beam to be very close to the dielectric. (Author)

AD-601 810 Div. 8, 5
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
APPLICATION OF A BINARY-DECIMAL CODE IN A DIGITAL READING IN A CODE-PULSE TELEMETRY SYSTEM,
by N. I. Kalatozishvili and K. N. Slovinskii. 19 May 64, 7p
FTD TT64 302 TT 64 11803
Unclassified report

Unedited rough draft trans. of Priborostroenie (USSR) 1963, no. 9, p. 18-19.

Descriptors: (*Telemeter systems, Coding), (*Coding, Telemeter systems), Pulse communication systems, Binary arithmetic, Data transmission systems, Digital recording systems, Circuits, Communication theory, USSR.

A binary-decimal code for transmitting signals of telemetry, which relieves the need for carrying out a great deal of conversions on the reception side, is proposed. In the code- pulse system of telemetry with a pickup in the form of a photo-converter for assuring the discreteness the rotatable disk is perforated for the binary code. In order to avoid gross errors in remote transmission a code with a minimul of error is selected, such as Gray's code. In the described binary-decima code the numbers of each decimal category are expressed by a four-category binary code-the tetrad. As a decimal code, in contrast to the direct decimal counting a reflex code (Gray's code) is used.

AD-601 814 Div. 8, 26
OTS Price $2.25

Westinghouse Defense and Space Center, Baltimore, Md.
FAILURE MECHANISMS IN MICROELECTRONICS.
Quarterly rept. no. 2, Aug-Oct 63
May 64, 75p
Contract AF30 602 3017, Proj. 5519, Task 551906
RADC TDR64 61
Unclassified report

Descriptors: (*Microminiaturization (Electronics), Failure (Mechanics)), (*Reliability (Electronics), Manufacturing methods), Quality control, Solid state physics, Manufacturing methods, Photoengraving, Silicon, Oxides, Diodes (Semiconductor), Aging (Materials), Electrical properties, Films, Test methods, Tests.

A series of 12 wafers with 625 devices each, fabricated in P-type, 10.4-ohm-cm silicon was processed through all fabricational stages, and measurements were made on the surface parameters at each stage of fabrication; in certain ones device characteristics were measured on individual devices on the wafers as a function of position, and results are being compared with the values of the surface measurement parameters previously obtained for the same device or area on the wafer during the processing stages. This work is continuing, and overall results will be available later. Present indications show variation in characteristics with position on the wafer, and that the two most drastic stages in fabricational processes affecting surface properties are the vapor etch and the photoetch. Evidence was obtained for the existence of insulating subvisible layers over certain windows but none over others in a wafer treated by supposedly uniform developing and photoetch. The relation of these layers to device performance and junction depth is being investigated, since in a complex device it may be a mechanism responsible for variations in characteristic performance or for punchthrough or shorting. (Author)

AD-601 815 Div. 8, 25, 30
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SINGLE-BAND SHF MODULATOR AS THE LOCAL OSCILLATOR IN A EPR SPECTROMETER.
by M. A. Ruban. 12 May 64, 11p
FTD TT64 317; TT 64 11806
Unclassified report

Unedited rough draft trans. of Pribory i Tekhnika Eksperimenta (USSR) 1963 [v. 8] no. 4, p. 103-106.

Descriptors: (*Modulators, Spectrum analyzers), (*Spectrum analyzers, Modulators), Diodes (Semiconductors), Design, Waveguide slots, Sensitivity, Analysis, Nuclear resonance, Superhigh frequency.

A single-band crystal diode modulator using a slotted bridge is described in which, as a result of combined amplitude and phase modulation of SHF diode oscillations, a single-band signal power of 0.5-0.6 mw is obtained when 5-7 mw are shunted into the modulator canal. The carrier and second side frequency are suppressed not less than 50-55 db. Suppression of the higher side frequencies is no worse than 30-35 db. The described modulator is of extremely simple design and may be made very compact. The device is successfully used in place of the local oscillator in a radiospectrometer for analysis of electron-nuclear double resonance. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-601 693 Div. 8
OTS Price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
UNIAXIAL DIELECTRIC RODS IN CYLINDRICAL CAVITIES.
Preliminary paper
by Ross F. Lohr Jr. Apr 64, 50p PIBMRI 1219 64
Grant AFOSR453 63
AFOSR 64 1120

Unclassified report

Descriptors: (*Masers, Ruby), (*Cavity resonators, Dielectric properties), (*Waveguides, Dielectric properties), (*Dielectrics, Rods), Tests, Frequency, Resonators, Tensor analysis, Permeability (Magnetic), Numerical analysis, Bessel functions, Partial differential equations, X band, K band.

In frequency regions well above the lowest resonant frequencies of a circularly cylindrical cavity, the mode density, i. e., the number of modes within a given, relatively small frequency interval, is generally quite high, and the identification of experimentally found resonances with specific cavity modes cannot usually be accomplished by frequency considerations alone. Two techniques useful in such identifications are presented here. One of these can be employed to gain information concerning the angular periodicity, of the mode, while the other gives an indication of its axial periodicity. A new method of measuring the dielectric constants (tensor) of a uniaxial material, which is based on the exact solution of a large dielectric rod located in a circularly cylindrical cavity is also presented. The characteristic equations required in this connection have been derived and are given. The techniques for identifying modes, as well as the dielectric constant measurement method, have been tested against theoretical computations (as far as this is possible) and have been found to be sound. Explicit values for the (X-band) dielectric constants of ruby have been determined experimentally. (Author)

AD-601 713 Div. 8
OTS Price $0.50

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
STUDY AND INVESTIGATION OF MILLIMETER AND SUBMILLIMETER WAVE RECEIVER TECHNIQUES.
May 64, 15p
Contract AF30 602 3046, Proj. 4505, Task 450501
RADC TDR64 136

Unclassified report

Descriptors: (*Radio receivers, Microwave frequency), (*Detectors, Microwave frequency), (*Microwave equipment, Detectors), (*Waveguides, Reflectors), Masers, Optical equipment, Beams (Electromagnetic), Backward-wave oscillators, Thermistors, Thermoelectricity, Electromagnetic waves, Theory, Numerical analysis.

The program has as its goal the development of video detection techniques which are appropriate for the millimeter and submillimeter range of the spectrum. Measurement of the sensitivity of the TGS pyroelectric effect detector indicates a minimum detectable signal level of approximately 4 microwatts. Additional studies on the theory of the reflecting beam waveguide indicate that at least two reflector shapes are permitted by the approximate theory developed for the analysis. If any differences in the electromagnetic fields corresponding to these two types of reflectors exist, they are obscured by the approximations made in the analysis. (Author)

AD-601 744 Div. 8, 26
OTS Price $1.10

Bomac Div., Varian Associates, Beverly, Mass.
BL-221 70 Gc MAGNETRON PRODUCTION ENGINEERING MEASURE.
Quarterly progress rept. no. 11, 6 Feb-6 May 64.
by Robert C. Sibley. 6 May 64, 7p
Contract DA36 039sc85974

Unclassified report

Descriptors: (*Magnetrons, Manufacturing methods), Extremely high frequency, Tests, Reliability (Electronics), Anodes (Electron tubes), Voltage, Positioning devices (Machinery), Machining, Transformers.

The following activities and work were pursued during this quarterly period. Five magnetrons were accepted at Final Qualification Test during March 1964. Three magnetrons were made to check hot frequency using anodes from available hobs. Parts are nearly complete for pilot production run. Negative results were obtained for tests eliminating hand de-burring and spark machining of the transformer slot. (Author)

AD-601 781 Div. 8, 15, 2
OTS Price $1.10

Mitre Corp., Bedford, Mass.
SIMPLIFIED POINTING EQUATIONS FOR SLAVING AN ANTENNA TO THE RADAR COORDINATES,
by R. Manasse. Sep 63, 10p MITRE TM3646
Contract AF19 628 2390, Proj. 750
ESD TDR63 492

Unclassified report

Descriptors: (*Antennas, Remote control systems), (*Radar equipment, Radar stations), (*Geodesics, Position finding), Targets, Range finding, Numerical analysis, Transformations (Mathematics), Geometry.

The advent of long-baseline radar and missile range instrumentation systems requires a capability to slave two or more antennas together so that they will point physically at the same point in space. Generally, when pencil beams are employed and the separation between antennas is comparable to the slant range of the target, a brute force implementation of the coordinate transformation equations is required. However, in systems where the separation between antennas is not more than 1/10 of the slant range of the target or so (depending on beamwidth), approximate equations for slaving the antennas together may prove satisfactory. It is the purpose of this paper to derive approximate expressions for the radar coordinates of a target at a slave site in terms of its radar coordinates at a master site. The equations are specialized to the important case where the two sites differ only in longitude, so that it is convenient to apply these equations to obtain the pointing angle corrections introduced by earth rotation. (Author)

AD-601 787 Div. 8, 30, 31
OTS Price $2.50

Navy Electronics Lab., San Diego, Calif.
ADAPTIVE PLANT IDENTIFICATION DIGITAL CONTROL SYSTEM.
Research and development rept., 3 Jun 63-1 Jan 64,
by W. V. Kershow. 30 Mar 64, 110p
Task 7128
NEL 1216

Unclassified report

Descriptors: (*Adaptive control systems, Digital computers), (*Digital computers, Adaptive control systems), Design, Performance (Engineering), Systems engineering, Shipborne, Control systems, Real time, Linear systems, Optimization, Identification systems, Functions, Integral transforms, Programming (Computers), Analog computers.

AD-601 850 Div. 8
OTS Price $4.00

Airborne Instruments Lab., Inc., Deer Park, N. Y.
INTERFERENCE ANALYSIS OF NEW COMPONENTS AND CIRCUITS.
Final rept.
by O. Hinckelmann, G. Kanischak, D. Kaye, A. Kiis and C. Nieves. May 64, 256p AIL 2719 1
Contract AF30 602 2919, Proj. 4540, Task 454002
RADC TDR64 161

Unclassified report

Descriptors: (*Semiconductor devices, Radio-frequency interference), (*Radiofrequency interference, Analysis), Circuits, Sensitivity, Measurement, Limiters, Ferrites, Radiofrequency filters, Radio signals, Radio receivers, Transistors, Diodes (Semiconductor), Varactor diodes.

The report is the result of an investigation to: (1) determine a satisfactory parameter to describe the interference susceptibility of solid-state components, (2) determine suitable solid-state components to be used as protective devices to reduce RFI susceptibility, and (3) determine the RFI and operational characteristics of signal-processing techniques to permit the best choice, in a given interference environment, consistent with satisfactory operational characteristics. The third-order intermodulation coefficient is shown to be the most suitable measure of RFI performance. A simple technique for measuring the parameter as well as experimental results are described. Three types of limiters are discussed and it is shown that the ferrite limiter generally has the characteristics most desirable in a device for RFI susceptibility reduction. Passive frequency filtering is also considered. (Author)

AD-601 857 Div. 8
OTS Price $0.50

Magnavox Co., Fort Wayne, Ind.
QUARTZ CRYSTAL OSCILLATOR CIRCUITS STUDY.
Final rept., 1 Sep 62-10 Apr 64
by D. Firth. 10 Jun 64, 17p TP64 1096
Contract DA36 039AMC00043E, Proj. 3A99 15 004

Unclassified report

Descriptors: (*Crystal oscillators, Quarts), (*Circuits, Crystal oscillators), Oscillators, Electron tubes, Transistors, Design, Operation, Temperature control, Equations, Handbooks.

The purpose of the program was to compile a quartz crystal oscillator design handbook to facilitate and systematize the design of quartz crystal oscillators, to eliminate crystal unit misapplications, to reduce design time and costs, and to increase the reliability of operation. The handbook is specifically directed at the wide operating temperature range, medium stability crystal oscillator prevalent in many types of communications equipment, although the basic design principles also apply to temperature controlled oscillators. In addition, the program was concerned with obtaining oscillator performance data for inclusion in the handbook.

AD-601 866 Div. 8, 5
OTS Price $1.75

Federal Aviation Agency, Washington, D. C.
DEVELOPMENT OF HF WIRE-GRID LENS ANTENNA.
Interim rept.
by G. D. Hadorn. May 64, 63p
Proj. 113 23D
FAA RD64 38

Unclassified report

Descriptors: (*Lens antenna, High frequency), Radio communication systems, Antennas, Design, Construction, Installation, Hawaii, Performance (Engineering), Test methods, Tests, Electronic equipment.

The report contains a qualitative explanation of the principles of operation of the wire-grid lens antenna, a description of the structure and the procedures used for its installation, and a summary of the preliminary performance tests conducted to date.

AD-601 867 Div. 8, 7
OTS Price $1.60

OTS Corp., Elkhart, Ind.
PRODUCTION ENGINEERING MEASURE FOR SUBMINATURE, TRANSISTOR TYPE POTENTIOMETERS.
Quarterly progress rept. no. 11, 1 Jan-31 Mar 64.
by C. L. Holmes and D. C. Kinsey. 31 Mar 64, 18p
Contract DA36 039sc85976

Unclassified report

Descriptors: (*Potentiometers, Production), (*Performance (Engineering), Potentiometers), (*Subminiature electronic equipment, Performance (Engineering)), Tests, Reliability (Electrontics), Transistors, Cermets, Torque, Moisture.

AD-601 869 Div. 8, 25
OTS Price $2.00

Microwave Devices Lab., Univ. of Utah, Salt Lake City.
MICROWAVE DEVICES LABORATORY CONSOLIDATED QUARTERLY REPORT. JANUARY 1, 1964-MARCH 31, 1964.
31 Mar 64, 80p MDL Q8
Contracts Nonr1288 05 and AF04 745

Unclassified report

Descriptors: (*Microwave equipment, Optical phenomena), (*Plasma Physics, Microwave frequency), (*Electron beams, Microwave frequency), (*Solid state physics, Microwave frequency), Magnetic fields, Electron tubes, Cyclotron waves, Space charges, Backward-wave oscillators, Waveguides, Lasers, Masers, Tunneling (Electronics), Equations, Mathematical analysis, Superconductivity, Exhaust flames, Quantum mechanics, Optics, Density.

The broad purpose of the research activity reported is to extend the useful frequency spectrum into the range from microwave frequencies to optical frequencies and to improve existing devices and techniques in the microwave spectrum. At present this objective is being pursued by studies of electron beam devices, solid state devices, and plasmas. (Author)

AD-601 875 Div. 8
OTS Price $2.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
A STUDY OF THE PERFORMANCE OF LINEAR AND NONLINEAR FILTERS.
by Vidal R. Algazi. 22 Jun 64, 110p RLE 420
Contract DA36 039AMC03200E; Grant DA SIG36 039 61G14

Unclassified report

Descriptors: (*Communication theory, Filters (Electromagnetic wave)), (*Filters (Electromagnetic wave), Performance (Engineering)), Linear systems, Nonlinear systems, Noise, Signals, Separation, Signal-to-noise ratio, Attenuators, Statistical distrubutions, Electromagnetic pulses, Errors, Numerical analysis.

AD-601 819 Div. 8, 26
OTS Price $0.75

Westinghouse Defense and Space Center, Baltimore, Md.
FAILURE MECHANISMS IN MICROELECTRONICS.
Quarterly rept. no. 3
May 64 27p
Contract AF30 602 3017, Proj. 5519 Task 551906
RADC TDR64 125

Unclassified report

Descriptors: (*Microminiaturization (Electronics), Failure (Mechanics)), (*Reliability (Electronics), Manufacturing methods), Solid state physics, Quality control, Amplifiers, Modules (Electronic), Diodes, Transistors, Resistors, Photoengraving, Silicon, Oxides, Films, Electrical properties, Test methods, Tests.

A specific microelectronic linear amplifying block, was chosen as the representative device for detailed examination. A description is given of the block and its performance characteristics indicated. A type of failure of isolation in the block was identified, and the mechanism responsible is described. The mechanism appears to be partially related to inequities in diffusion of dopant during the first diffusion. Correlation between photovoltage and the unsuitable region on the device is described. A re-analysis and confirmation of the relation between reverse breakdown voltage and junction depth indicates that the effect of layers of oxide left on the silicon just before diffusion, through variations of the photo-etch procedure, is to provide slight additional source strength in the diffusion, and therefore a slightly greater reverse breakdown voltage. (Author)

AD-601 820 Div. 8, 25
OTS Price $1.75

Shockley Transistor Div., Clevite Transistor, Palo Alto, Calif.
FAILURE MECHANISMS IN SILICON SEMICONDUCTORS.
Quarterly rept. no. 4, 30 Nov 63-29 Feb 64
by W. Schroen, W. W. Hooper, and H. J. Queisser. May 64, 65p
Contract AF30 602 3016, Proj. 5519, Task 551906
RADC TDR64 153

Unclassified report

Descriptors: (*Semiconductors, Failure (Mechanics)), (*Transistors, Silicon), Surface properties, Voltage, Sensitivity, Light, Electric fields, Thermal properties, Reliability (Electronics), Resistance (Electrical), Oxides, Static electricity.

Investigations were made of surface phenomena on oxide-protected silicon devices. The problem of surface breakdown is considered. Surface breakdown voltage can be altered by supplying charge to surface states either by illumination or field effect. Junctions with anomalous local regions are investigated, showing spots of high sensitivity to light. SiO2 resistance was measured. A resistance drift was observed, with a time constant of approximately fifteen minutes. Investigations were made of current concentrations in silicon power transistors when thermally induced breakdown is produced (second breakdown phenomenon). Most emphasis was put on transistors which exhibited low contact resistance between aluminum contact and emitter silicon. Two types of transistors were investigated: Those which showed second breakdown at spots of elevated temperatures (hot spots), and those which showed second breakdown at spots initially not included in areas of elevated temperatures. (Author)

AD-601 826 Div. 8, 26
OTS Price $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF SOLID ELECTROLYTE TANTALUM CAPACITORS.
Quarterly rept. no. 2, 29 Sep-29 Dec 63
by J. M. Eckfeldt and J. H. D. Folster. 29 Dec 63, 18p
Contract DA36 039AMC03621E

Unclassified report

Descriptors: (*Tantalum capacitors, Reliability (Electronics)), Performance (Engineering), Production, Life expectancy, Tests, Powder metals, Coatings, Manganese compounds, Manufacturing methods, Dioxides, Seals (stoppers), Soldering.

The manufacturing of experimental lots of the 330 microfarads-6 V rating proceeded on schedule. Early indications have shown that the quality of this rating was improved through the use of a special tantalum powder. Mechanization of the assembly operation progressed to the point of completing construction on approximately one half of the equipment. Further design work was done on the fixtures remaining to be built. Life testing was started on all experimental lots which completed production at Concord. No catastrophic failures have occurred on either the 85C test or the 125C test as of the end of this reporting period. However, failures due to leakage current drift occurred to a varying degree on initial lots completing 1000 hours of the mildly accelerated life test of 125C and rated voltage. (Author)

AD-601 843 Div. 8
OTS Price $1.00

Cruft Lab., Harvard Univ., Cambridge, Mass.
THE IMPERFECTLY CONDUCTING CYLINDRICAL TRANSMITTING ANTENNA,
by Ronald W. P. King and Ta Tsun Wu. 27 Mar 64, 39p
Cruft TR-440
Contract Nonr1866 32, Proj. NR371 016

Unclassified report

Descriptors: (*Antennas, Electrical properties), Broadband, Resistance (Electrical), Electrical impedance, Electric currents, Distribution, Admittance, Integral equations, Trigonometry, Functions, Electrical conductance, Numerical analysis, Antenna configurations.

The properties of a cylindrical antenna with a continuous ohmic resistance along its length are of interest in the design of certain types of directive broad-band antennas. Conventionally, the contribution by ohmic resistance to the distribution of current and the impedance is contained in a particular integral that is either ignored or treated as a higher order correction to formulas derived for perfectly conducting antennas. An alternative and more useful form has been developed in which the integral equation for the current is rearranged to permit the introduction of a complex propagation constant k. An approximate solution of this equation is then obtained in terms of the three trigonometric functions, sin k (h-absolute value of z), cos kz - cos k h and cos 1/2 k0z-cos 1/2 k0h where k0 is the free-space wave number. Expressions are derived for the coefficients of these functions and for k. Explicit formulas are given for the distribution of current and the admittance. (Author)

AD-601 898 Div. 8, 25
OTS Price $2.25

Elcon Lab., Inc., Peabody, Mass.
DESIGN AND EVALUATION OF AN ION BEAM DELAY LINE.
Final rept.
by Robert C. Siegel and Edwin Langberg. 30 Apr 64, 81p
ELI R-4 64 3
Contract AF19 628 2762, Proj. 4645, Task 464503
AFCRL 64 373

Unclassified report

Descriptors: (*Delay lines, Ion beams), (*Ion beams, Delay lines), (*Plasma sheath, Delay lines), Particle beams, Focusing, Nickel, Tungsten, Emissivity, Cesium, Space charges, Design, Construction, Tests.

The theory and evaluation of a signal delay technique based on the travel time of an ion beam through an equipotential drift space filled with plasma are examined. Attention is given to plasma potential distribution and the control of particle trajectories by the use of magnetic and electrostatic-sheath focusing. Emission characteristics of nickel and tungsten in a cesium environment, sheath phenomena, space-charge neutralization, design data, construction techniques and evaluation tests are described in detail. Results indicate the basic soundness of the ion beam delay line concept. Ultimate characteristics of a tube using this technique could reasonably include (1) bandwidths from d. c. to 40 M. C. or higher, (2) voltage controlled delay from several microseconds to a millisecond, (3) low insertion loss and (4) a noise level no greater than that due to the random fluctuation of ion current. (Author)

AD-601 915 Div. 8
OTS Price $3.60

Lansdale Div., Philco Corp., Pa.
DEVELOPMENT AND FABRICATION OF A 5 Kmc ELECTROCHEMICAL SWITCHING TRANSISTOR.
Final rept. for 15 Jan 61-14 Apr 62
by Donald M. Schmechel. 14 Apr 62, 35p Philco R478 1
Contract AF19 604 7400
ESD tdr64 445

Unclassified report

Subcontract to Lincoln Lab., Mass. Inst. of Tech.

Descriptors: (*Transistors, Germanium), (*Electronic switches, Transistors), Semiconductor devices, Design, Construction, Tests, Electrochemistry, Containers, Etched crystals, Crystal growth.

The report describes the theoretical and experimental investigations which were performed to fabricate a germanium transistor exhibiting an f sub t of 5 Kmc/sec. Standard electrochemical methods with some necessary modifications were employed to fabricate the transistors. The intrinsic f sub t of the fabricated transistor was determined to be 5 Kmc or greater but, due to an electrical interaction between the passive elements in the transistor and the TO-18 enclosure, useful measurement of this quantity could not be made. Recommendations are made for future work involving investigation of the influence of f sub t on switching speeds, more accurate definition of relationship between measured f sub t and device parameters, development of advanced transistor structures, and design and construction of a suitable enclosure for high speed devices. (Author)

AD-601 917 Div. 8, 20
OTS Price $0.75

Martin Marietta Corp., Baltimore, Md.
THERMIONIC DOUBLE-DIODE PROGRAM.
Quarterly technical progress rept. 16 Mar-15 Jun 64.
30 Jun 64, 22p MND3149 1
Contract AF33 615 1289, Proj. 8173, Task 817305

Unclassified report

Descriptors: (*Thermionic converters, Diodes (Electron tubes), (*Diodes (Electron tubes), Design), Production, Thermionic emission, Electron bombardment, Modules (Electronic), Reactor fuels.

Engineering design of the improved double-diode module was completed. Design refinements and improvements on the fueled emitter design, module configuration, design features affecting performance, manufacturing techniques and instrumentation were incorporated into the previous double-diode module design. Manufacturing drawings were completed and released. Material procurement was completed and fabrication of details for all components for the modules and test fixtures and instrumentation was initiated. Fabrication of the fueled emitters for the thermal endurance and vacuum tests was started. (Author)

AD-601 920 Div. 8
OTS Price $0.75

Bliley Electric Co., Erie, Pa.
PRODUCTION ENGINEERING MEASURE. CR-(XM-45)/U QUARTZ CRYSTAL UNITS (RUGGEDIZED, LOW FREQUENCY).
Quarterly progress rept. no. 6, 1 Sep-1 Dec 63.
by J. M. Wolfskill, A. R. Krespan, and Robert Mouck.
1 Dec 63, 28p
Contract DA36 039sc86719

Unclassified report

Descriptors: (*Quartz resonators, Production), Low frequency, Vibration, Temperature, Stability, Design, Military requirements, Crystals.

The CR-(XM-45)/U crystals are ruggedized units in the 90-Kc to 200-Kc frequency range. The original requirements were that these units have much more stringent temperature-frequency stability than the standard CR-42A units of specification MIL-C-3098, as well as have the ability to take 10-cps to 2,000-cps, 15-G vibration. It proved to be impossible to meet the original requirements; the ruggedized CR-(XM-45)/U units could not attain tighter temperature-frequency stability than the ±0.002% demanded of the non-ruggedized CR-42A's. Investigation was made to determine realistic requirements which could be met by units which were able to meet the new vibration requirement. It was found that the rugged units could be made to meet the same performance levels as the non-rugged (CR-42A/U) units, provided an additional 3.5-pf capacitance were permitted and a maximum resistance value of 7,500 ohms were allowed. (Author)

AD-601 921 Div. 8
OTS Price $3.50

Photocircuits Corp., Glen Cove, N. Y.
MICROMINIATURE LAYERED PRINTED WIRING.
Final rept. no. 4, 15 Jun 62-15 Aug 63
by G. Messner, R. McCaw and M. Paluszek. 15 Aug 63, 203p
Contract DA36 039SC90763, Proj. 3A99 15 002, Task 3A99 15 002 03

Unclassified report

Descriptors: (*Printed circuits, Microminiaturization (Electronics)), (*Microminiaturization (Electronics), Printed circuits), (*Wiring diagrams, Tests), Manufacturing methods, Test methods, Military requirements.

A measure of the performance of filters is proposed which compares the filter under study to an optimum attenuator acting on the same input. The noise level (noise-to-message power ratio) is emphasized as an independent parameter important to the behavior and the performance of both linear and nonlinear filters. For optimum and nonoptimum linear filters, the effect of the noise level on the performance is the specific object of study. For nonlinear no-memory filters after consisdering the determination of the optimum filter for mean-square and non mean-square criteria, the characteristics of the message and the noise are investigated for which the optimum mean-square filter reduces to an attenuator. At the other extreme of behavior, perfect separation by a nonlinear no-memory filter will not occur for any message of interest, and the selection of the message of a defined class which will give the smallest (or largest) average weighted error is considered. For a given noise, a given error criterion, and a known filter, messages are considered that have prescribed peak and average power (Author)

AD-601 876 Div. 8; 2, 7, 20
OTS Price $3.00

Battelle Memorial Inst., Columbus, Ohio.
SPACE ENVIRONMENTAL EFFECTS ON MATERIALS AND COMPONENTS. VOLUME II. ELECTRONIC AND MECHANICAL COMPONENTS,
by D. J. Hamman and E. M. Wyler 1 Apr 64, 168p
Contract DA01 021AMC203Z
RSIC 151

Unclassified report

Descriptors: (*Space environmental conditions, Electronic equipment), (*Electronic equipment, Space environmental conditions), Nuclear particles, Electrical equipment, Vacuum, Ionization, Fixed resistors, Variable resistors, Potentiometers, Capacitors, Relays, Thermistors, Semiconductor devices, Electron tubes, Transformers, Metals, Solar cells, Magnetic materials, Wire, Bearings.

The major emphasis of this literature survey concerns the effect s of vacuum and space radiation on organic materials and electronic and mechanical components and materials.

AD-601 881 Div. 8
OTS Price $6.60

Microwave Associates, Inc., Burlington, Mass.
UHF DUPLEXERS.
Final progress rept., Nov 63-May 64,
by Henry Griffin and Sumner Segal. May 64, 65p
Contract NObsr89105, Proj. SF0010205, Task 6158

Unclassified report

Descriptors: (*Radar duplexers, Ultrahigh frequency), (*Semiconductor devices, Radar duplexers), Waveguide circulators, Ferrites, Diodes (Semiconductor), Limiters, Switching circuits, Dielectrics, Electrical corona, Heat transfer, Resonance, Circuits, Construction.

A three port ferrite circulator was developed that successfully demonstrated a power handling capability of 500 KW peak power and 10 KW average power. The insertion loss is less than 0.5 db over the band 400 to 450 Mc. For receiver protection after the ferrite circulator, a solid-state diode limiter was developed. The insertion loss of the limiter is less than 0.8 db over the 400 to 450 Mc band. A power handling capability of 150 KW peak and 1.5 KW average was demonstrated with a 60 microsec. pulse width. A leakage power of 300 mw peak was obtained with no spike leakage. For the 200 to 225 Mc band, a complete solid-state diode limiter was achieved that can successfully switch 200 KW peak power, 10 KW average power, with a 200 microsec. pulse width. A transmit loss of 0.1 db and receive loss of 2.0 db was obtained with a leakage power of 50 mw peak to the receiver. (Author)

AD-601 889 Div. 8, 25, 26
OTS Price $3.50

General Electric Co., Syracuse, N. Y.
PRODUCTION ENGINEERING MEASURE. ITEM 9 SILICON GROWN DIFFUSED TRANSISTOR TYPE 2N336.
Final rept., 30 Apr 62-30 Apr 64.
by P. W. Olski. 30 Apr 64, 238p
Contract DA36 039sc86727E

Unclassified report

Descriptors: (*Transistors, Production), (*Silicon, Transistors), Epitaxial growth, Reliability (Electronics), Processing, Failure (Mechanics), Encapsulation, Specifications, Quality control, Management engineering, Temperature, Stresses.

Presented are the improved passivation and encapsulation techniques as well as the evaluation of the effectiveness of these techniques, the reliability estimate as a function of stress and a multi-level high reliability specification which characterizes the device for high reliability applications. The expected failure rate, at the upper 90% confidence limit as extrapolated using least square techniques and the Arrhenius failure model, is shown to be 0.01% per 1000 hours operation at 235 mw at 25C ambient temperature. As a result of this work a multi-level high reliability device specification has been written about this production line. This specification and the qualification testing to it are included in this report. (Author)

AD-601 895 Div. 8
OTS Price $1.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
LOW-FREQUENCY CURRENT-PROBE SYSTEM FOR MEASURING CONDUCTED RADIO-FREQUENCY INTERFERENCE.
Technical rept.
by J. L. Brooks. 25 Jun 64, 56p
Proj. Y F006 09 02 205
NCEL R304

Unclassified report

Descriptors: (*Radiofrequency interference, Measurement), (*Probes (Electromagnetic), Design), Measuring devices (Electrical and Electronic), Circuits, Impedence, Noise (Radio), Phase measurement, Meters, Attenuators.

A new approach to the problem of measuring conducted radio-frequency interference is described. An instrument was developed which has the capability of measuring the impedance levels and noise currents of a power line or cord which is to be tested for conducted interference. The report describes the instrument in detail. The outstanding features of this instrument are, first its simplicity of operation in that the impedance magnitude and phase angle of the line are presented automatically on panel meters, and secondly the completeness with which the conducted RFI may be measured. Either the noise-source impedance or the load impedance or both may be determined easily with this instrument. The RFI currents may be measured in a conventional manner. Knowing the impedance levels of the line under test and the RFI current which pass through them enables one to specify completely in terms of the fundamental units of power the RFI characteristics of the line under test. An evaluation of the hardware developed is presented, as well as numerous examples of RFI measurements showing the correlation between measured and predicted results. The design accuracy of the system is ± 10 percent for the frequency range from 20 kc to 2 mc and the impedance range from 10 to 10,000 ohms at 0 to 360 degrees. (Author)

rated power has been met. The estimated failure rate with a 90% confidence limit at the end of the contract period was 0.00032%/1000 hours. (Author)

AD-601 955 Div. 8, 25, 26
OTS Price $1.25

Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURES TO INCREASE TRANSISTOR RELIABILITY. PROCESS SPECIFICATIONS. 2N744 SERIES.
Final engineering rept., item 3
30 Jun 64, 49p, TII 03 64 40
Contract DA36 039SC86730

Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Epitaxial growth, Coatings, Cleaning, Quality control, Specifications, Processing, Boron, Silicon, Spectrophotometers, Reliability (Electronics), Semiconductor device, Films, Thickness, Resistance (Electrical).

Process specifications and methods for the manufacture of transistors of increased reliability are outlined. Topics in the report include: (1) HCL etching of epitaxial substrates; (2) measuring silicon epitaxial film thickness, I. R. Spectrophotometer method; (3) measuring silicon epitaxial resistivity; (4) cleaning slices, silicon organic removal, Walking Beam Machine method; (5) depositing (Boron B203 Box) slices, silicon planar; (6) operating dryer system, Kemp model 15 EM-1; (7) depositing (ammonium phosphate emitter) slices, silicon planar; (8) purifying KMER, silicon transistors; (9) cleaning and drying (prephoto resist) slices, silicon; (10) exposing photo resist coated slices; (11) developing slices, silicon (exposed, KMER coated); (12) mixing solution, Bell Etch No. 2-A; (13) metalizing (gold collector) slice, silicon planar; (14) alloying contacts (infrared) silicon; and (15) Header-TO-18.025 Post.

AD-601 956 Div. 8, 25, 26
OTS Price $2.25

Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURES TO INCREASE TRANSISTOR RELIABILITY. 2N960 SERIES.
Final engineering rept., item 2, 1 May 62-31 Dec 63
3 Mar 64, 94p TII 03 64 12
Contract DA36 039SC86730

Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Epitaxial growth, Diffusion, Cleaning, Surface properties, Evaporation, Quality control, Bonding, Protective treatments, Encapsulation, Processing, Welding, Semiconductor devices, Failure (Mechanics), Life expectancy, Germanium, Specifications, Reliability (Electronics), Tests.

This report covers all work performed on production engineering measures to increase transistor reliability during the contract period May 1, 1963 to January 31, 1964. Process improvement work was done and reliability testing performed. Improvements were installed throughout the process to gain better control on manufacturing steps, and to reduce operator dependency. Process modifications were also made to enhance the effectiveness of operations. Acceptance criteria for both manufacturing and quality control inspection operations have been more specifically defined and tightened. This assures the end product to be more uniform and provides an improved ability to separate out the mavarick devices which contribute to the failure rate. Reliability testing on a total of 2200 transistor at three power levels; one, one and one-half, and twice maximum rated power, has shown an extrapolated failure rate that is less than 0.01% per 1000 hours at 25C with a 90% confidence level. (Author)

AD-601 959 Div. 8, 15
OTS Price $2.25

Electron Physics Lab., Univ. of Michigan, Ann Arbor.
DIGITAL COMPUTER ANALYSIS OF CROSSED-FIELD ELECTRON GUNS.
Technical rept. no. 71,
by J. E. Boers. Apr 64, 83p ORA06349 1T
Contract AF33 615 1553, Proj. 06349

Unclassified report

Descriptors: (*Crossed field devices, Electron guns), (*Electron guns, Mathematical analysis), Programming (Computers), Digital computers, Voltage, Difference equations, Matrix algebra, Cathodes, Electron beams, Space Charges.

A digital computer program written in the IBM 7090 FORTRAN programming system is described and then employed in the analysis of several crossed-field guns. The digital program employs relaxation techniques while alternately computing electric fields and trajectories. One cycle through the program consists of three basic parts. (1) Calculation of the voltages within the gun by solving Poisson's equation, in difference form, on a 7200 point matrix on which electrode potentials are laid out. (2) Calculations of new current densities along the cathode and the setting up of trajectory starting points along the cathode to simulate these densities. (3) Calculation of trajectories and comparison of the new beam with the previous one. Thermal effects and direct particle-particle interaction effects are ignored but space-charge effects, introduced through the field calculations, tend to prevent excessive or unusual trajectory crossings. Execution time on a 7090 varies from 5 to 10 minutes depending on gun design, with better designed guns generally running faster. Results produced by the program are presented and compared with experimental and analytical results. Agreement with experimental results within 5 percent should be obtainable. (Author)

AD-601 960 Div. 8, 25, 26
OTS Price $2.75

Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURE TO INCREASE TRANSISTOR RELIABILITY. PROCESS SPECIFICATIONS. 2N960 SERIES.
Final engineering rept., item 2.
30 Jun 64, 126p TII 03 64 41
Contract DA36 039sc86730

Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Epitaxial growth, Evaporation, Coatings, Germanium, Gold, Silver, Antimony, Aluminum, Dessicants, Welding, Cleaning, Diffusion, Quality control, Surface properties, Specifications, Processing, Reliability (Electronics), Semiconductor devices, Bonding, Specifications.

Process specifications, required equipment, purchased parts, and methods for the manufacture of transitors of increased reliability are outlined.

AD-601 975 Div. 8, 26
OTS Price $0.75

TRW Semiconductors, Inc., Lawndale, Calif.
PRODUCTION ENGINEERING MEASURE. RELIABILITY THRU PROCESS IMPROVEMENT (2N1506).
Quarterly rept. no. 7, 31 Dec 63-31 Mar 64,
by R. Austin, G. Kamienski, and P. Kellow. 31 Mar 64,
12p TRWS 3000 43Q7
Contract DA36 039sc86742

Unclassified report

The results of work performed proved the feasibility of producing microminiature multilayered printed wiring boards with plated-through holes located on .050 inch centers. The results of tests performed on 400 samples of 3 different patterns demonstrated that such boards can withstand the environmental conditions specified and will generally meet the requirements of this specification, with certain minor exceptions or deviations. The design and processing requirements for the manufacture of such microminiature multilayer boards have been established and reflected in recommended purchasing specifications. All processes required and employed in the manufacture of such boards are within the scope of the present state of the art of the printed wiring industry and can be duplicated by any qualified manufacturer in this field. The main portion of the report is devoted to description and discussion of testing procedures and test results obtained from samples of microminiature multilayer printed wiring boards. (Author)

AD-601 942 Div. 8, 15
OTS Price $1.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE PERIODIC ANALYSIS OF SAMPLED DATA.
Group rept.,
by E. Korngold. 15 Jun 64, 53p LL 1964 32
Contract AF19 628 500
ESD TDR64 338

Unclassified report

Descriptors: (*Statistical processes, Sampling), (*Sampling, Mathematical analysis), (*Communication theory, Statistical processes), Fourier analysis, Integral transforms, Series, Functions, Continuous spectrum, Mathematical models, Frequency, Direct current, Noise (Radar), Bandwidth, Electronic equipment, Harmonic analysis, Stochastic processes.

A brief survey is given of some currently used techniques of periodic analysis of sampled data. Almost every periodic analysis of empirical data eventually relies on one of the following three techniques: (1) regression analysis on a trigonometric polynomial; (2) periodogram analysis; (3) the estimation of power spectra. Each of these techniques is best applied under distinct modeling assumptions, and an attempt has been made to discuss their applicability and their range of validity under various circumstances. After a brief introduction in Chapter I, Chaper II proceeds to describe the models in use and the statistical properties of the estimates associated with them. The effects of sampling and some of their implications in practical situations are treated in Chapter III. Chapter IV relates several common question areas to the theory developed in the earlier portions of the report, and presents some illustrations of the power of the techniques discussed. Finally, Chapter V gives the briefest outline of the general requirements of a comprehensive program in time series data analysis. (Author)

AD-601 947 Div. 8, 25
OTS Price $1.00

Electron Physics Lab., Univ. of Michigan, Ann Arbor.
NOISE PROPAGATION IN AN ACCELERATED NONUNIFORM ELECTRON GAS.
Technical rept. no. 70,
by G. Hok. Mar 64, 37p ORA 05000 13T
Contract AF33 657 8050, Projs. 4156; 05000, Task 415603

Unclassified report

Descriptors: (*Microwave equipment, Noise), (*Electron beams, Noise), (*Noise, Propagation), Plasma oscillations, Shock waves, Damping, Reflection, Mathematical analysis.

Approximate phase-integral solutions of the differential equation for adiabatic propagation of plane compressional waves in an accelerated electron stream are studied. The adiabatic assumption excludes Landau damping, but since the conditions under which Landau damping is to be expected are well understood, this fact is not a serious disadvantage. The approximate solutions are analyzed for stop bands, phase velocities, and conditions favorable to Landau damping Previously known results are obtained as asymptotic limits. A singularity analogous to a shock wave is found at the plane where the stream velocity equals the sound velocity in the electron gas. No suggestion of a noise-reducing mechanism beyond this plane is found. This would indicate that a minimum noise temperature of about 1/6 of the cathode temperature would be obtainable, if a total reflection of noise occurred at the shock plane. A three-dimensional pattern of tilted shock waves could possibly reduce the noise temperature below this value. (Author)

AD-601 950 Div. 8
OTS Price $0.75

Bliley Electric Co., Erie, Pa.
PRODUCTION ENGINEERING MEASURE. CR-(XM-45) /U QUARTZ CRYSTAL UNITS (RUGGEDIZED, LOW-FREQUENCY).
Quarterly progress rept. no. 7, 1 Dec 63-28 Feb 64,
by J. M. Wolfskill, A. R. Krespan, and R. Mouck. 28 Feb 64, 27p
Contract DA36 039sc86719

Unclassified report

Descriptors: (*Quartz resonators, Production), Low frequency, Vibration, Crystals, Quartz, Specifications, Military requirements, Design, Performance (Engineering).

The CR-(XM-45) /U are ruggedized, low-frequency quartz crystal units. They are able to withstand severe vibration; 10 to 2,000 cps at 15-G acceleration. The report describes the preproduction phase of the project. Details of the designs for units at 90 KC, 150 KC, and 200 KC are given, as well as outlines of the fabrication techniques. Data from the preproduction tests of specification MIL-C-3098C are presented for 30 units; 10 of each frequency. Evaluation of the data indicates that the stringent vibration requirement was met, performance levels were directly comparable to those of the regular CR-42A units, capacitance values were well within the new requirements (about 3.5 pf higher than for CR-42A's), and resistance values were well under the 7,500-ohm maximum. (Author)

AD-601 954 Div. 8, 25, 26
OTS Price $1.50

Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURES TO INCREASE TRANSISTOR RELIABILITY. 2N744.
Final rept., item 3, 1 May 62-31 Oct 63
31 Oct 63, 59p
Contract DA36 039SC86730

Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Silicon, Epitaxial growth, Heat treatment, Tests, Processing, Boron compounds, Oxides, Electrical engineering, Cleaning, Diffusion, Reliability (Electronics), Semiconductor devices, Quality control.

Several process improvements and refinements were incorporated into the manufacturing cycle of the NPN silicon planar 2N744 transistor. Improvements were realized in the areas of: epitaxial material, slice cleanliness prior to high temperature processing, control of both base and emitter diffusions, photo-resist pattern definition and control, control, package, and collector contacts. The device reliability level at the start of the contract was determined to be 4.2%/1000 hrs with a 90% confidence level. The program objective failure rate of 0.001%/1000 hours at 5% of

AD-602 005 Div. 8, 26
OTS Price $1.25

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURE. MECHANIZATION OF SEMICONDUCTOR DEVICES, 2N559, 2N1094.
Quarterly progress rept. no. 25, 1 Jan-31 Mar 64
by M. N. Reppert. 31 Mar 64, 41p
Contract DA36 039SC72729

Unclassified report

Descriptors: (*Semiconductor devices, Production), (*Transistors, Production), Machines, Industrial production, Guided missile components.

AD-602 006 Div. 8, 25, 26
OTS Price $1.50

Western Electric Co., Laurendale, Pa.
PRODUCTION ENGINEERING MEASURE. MECHANIZATION OF SEMICONDUCTOR DEVICES, 2N560, 2N1051, 2N1072, 2N1195, 1N664, 1N665, 1N666, 1N667, 1N668, 1N669, 1N673, 1N675, 1N697 and 1N701.
Quarterly progress rept. no. 18, 1 Jan-31 Mar 64
by M. N. Reppert. 31 Mar 64, 52p
Contract DA36 039SC81294

Unclassified report

Descriptors: (*Semiconductor devices, Production), (*Transistors, Production), (*Diodes (Semiconductor), Production), Industrial production, Machines, Guided missile components.

AD-602 013 Div. 8, 25, 26
OTS Price $2.60

TRW Semiconductors, Inc., Lawndale, Calif.
PRODUCTION ENGINEERING MEASURE. TRANSISTOR, VHF, SILICON, POWER (25W-100mc).
Quarterly rept. no. 7, 1 Jan-31 Mar 64,
by B. Rappaport. 31 Mar 64, 27p, TRWS 3000 47Q7
Contract DA36 039SC86733

Unclassified report

Descriptors: (*Transistors, Production), (*Silicon, Transistors), Manufacturing methods, Silicon, Gain, Power, Effectiveness, Very high frequency, Metal coatings, Plating, Performance (Engineering), Tests, Design, Brazing, Transistor amplifiers, Oscillators.

The period was devoted to processing material through the pilot line equipment to determine the capabilities of the existing processes and to make improvements where necessary. A contact metallizing process was established which eliminated two plating steps previously required. Improvements in the base diffusion and photoresist processes were instituted. These improvements and others described in this report should result in a considerable yield increase. The 25 volt design discussed in the previous quarterly report was processed exclusively during this time. First test results indicate that this design will meet the basic performance goals of power, gain and efficiency required by the contract. A description of the completed pilot line facility is given. (Author)

AD-602 027 Div. 8, 25
OTS Price $1.50

Lansdale Div., Philco Corp., Pa.
RESEARCH AND DEVELOPMENT TO OBTAIN SEMICONDUCTOR DIODES FOR ELECTRONIC TUNING.
Interim engineering rept. no. 3, 27 Dec 63-26 Mar 64.
26 Mar 64, 56p Philco R182 1
Contract NObsr89508, Proj. SR0080301, Task 9351

Unclassified report

Descriptors: (*Diodes (Semiconductor), Tuning devices), (*Tuning devices, Diodes (Semiconductor)), Epitaxial growth, Silicon, Diffusion, Avalanche diodes, Silicon compounds, Dioxides, Surface properties, Voltage, Electrical properties, Microstructure, Production, Manufacturing methods.

The guard-ring structure offers significant advantages over the double-epitaxial-layer structure. Using the guard-ring structure, plus processing changes to lower the electrical field at the periphery of the junction, has resulted in a significant increase in the level of breakdown voltage attained in diodes. The feasibility of fabricating large-area planar silicon diodes which meet all of the objective electrical specifications for Devices A and B has been conclusively established. Because of the inherent advantages of the planar process, diodes made by this refined planar process are superior to devices made by other technologies. (Author)

AD-602 032 Div. 8, 5
OTS Price $2.00

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
EVALUATION OF SIMPLE CODES TRANSMITTED OVER A 5000-MILE HF PATH.
by E. D. Moyes. Jan 64, 72p
Task 1G6 41209D534 18 06
AELRDL TR2450

Unclassified report

Descriptors: (*Coding, Radio communication systems), (*Communication theory, Coding), Global communication systems, Errors, Detection, Corrections, Radio waves, Ionospheric propagation, Radio teletype systems, Electronic equipment, Circuits, High frequency, Test methods, Tests.

The use of coding for error detection and correction is of extreme importance for the reduction of error rates in the field of communications. A Bose-Chaudhuri Code and Wagner Code were implemented and tested on the ionospheric path from Kahuku Point, Oahu, Hawaii to Deal, N. J. The data obtained from these coding techniques are compared to data from a standard, non-coded channel over the identical path at the same time. (Author)

AD-602 043 Div. 8, 25
OTS Price $6.60

Philco Corp., Blue Bell, Pa.
THIN FILM ACTIVE DEVICES.
Final rept. for 22 Jun-30 Sep 63
by James P. Spratt. 20 Feb 64, 65p
Contract DA49 186ORD1056

Unclassified report

Descriptors: (*Semiconducting films, Tunneling (Electronics)), (*Triodes, Metal films), Electric insulation, Aluminum compounds, Oxides, Oxidation, Amplifiers, Evaporation, Electrons, Gain, Equations, Electron guns, Modulators, Phonons, Electrical impedance, Electrodes, Semiconductors.

A semiquantitative analysis was performed of methods of collection of hot electrons at an internal potential barrier. It was shown that such collection may be unlikely for electrons injected by any but Schottky barrier emitter, and that even this type of emission is not too promising. An experiment was devised to confirm the above analysis of hot electron collection. This experiment involved studying the transmission through thin metal films of low energy electrons from an electron gun. A study of fabrication techniques for the production of thin layers of aluminum oxide was conducted to develop tunnel junctions and insulating layers. Thermal oxidation of aluminum was found to be unsatisfactory because of the high incidence of shorts. Reactive evaporation of

Descriptors: (*Transistors, Manufacturing methods), (*Quality control, Transistors), Bonding, Gold, Aluminum, Reliability (Electronics), Performance (Engineering), Production, Life expectancy, Test methods, Tests.

Reliability evaluation of the 2N1506 transistor was conducted. This phase was in the area of internal leadbonding to metallized surfaces. The first experimental group consisted of Wedge wire bonding with aluminum wire. The second consisted of Nail-Head wire bonding with gold wire. The third and control group comprised standard production bonding (wedge wire bonding with gold wire). The detailed processing and test evaluation steps are presented. The test conditions are listed. The evaluation summary for each lot by test evaluation performed is presented in tabular form.

AD-601 983 Div. 8, 30
OTS Price $6.60

Electrical Engineering Research Lab., Cornell Univ., Ithaca, N. Y.
DESIGN AND CONSTRUCTION OF A MATCHED FILTER.
Technical rept. no. 79
by T. Parks. Apr 64, 65p EERL 6
Contract DA36 039AMC00034E

Unclassified report

Descriptors: (*Radiofrequency filters, Design), Signal-to-noise ratio, Electrical impedance, Gain, Vacuum apparatus, Experimental data, Broadband, Coding, Delay lines, Networks, Noise (Radio), Equations, Coils, Signal generators, Capacitance, Very high frequency, Analog computers, Simulation, Performance (Engineering), Systems engineering.

The research concerned the design, construction and evaluation of a laboratory model of a wide-band filter matched to a seven-pulse code. A modified link structure with two grid lines provided for both positive and negative coefficients. The grid and plate lines, designed for maximally flat delay, were constructed by cascading constant-resistance all-pass networks, based on the unbalanced lattice. The measured ratio of central to side peaks was about 80 per cent of the theoretical value. (Author)

AD-601 988 Div. 8
OTS Price $0.50

Laboratory for Electroscience Research, New York Univ., N. Y.
ON THE INTRINSIC SHORT-CIRCUIT CURRENT GAIN OF DIFFUSED BASE TRANSISTORS.
Scientific rept. no. 11,
by J. J. Kelly and M. S. Ghausi. 14 May 64, 20p
NYU TR400 94
Contract AF19 628 379, Proj. 5628, Task 562806
AFCRL 64 345

Unclassified report

Descriptors: (*Transistors, Gain), Frequency, Circuits, Diffusion, Mathematical analysis, Trigonometry, Electric currents.

An analytic approximation to the expression for the intrinsic short-circuit current gain of the diffused base transistor in the common base configuration is obtained. The method of approximation utilizes the product expansion of the transcendental functions. The infinite product expansion shows the effects of all the poles of the gain function. The equations are simple to interpret and give insight into the operation of the transistor in the region above the alpha cutoff frequency. An analytic expression for the single pole approximation with excess phase is also obtained which method avoids tedious and involved computations made to determine the 3db frequency and the phase angle at the 3db frequency or a somewhat higher frequency. The analytic approximate expression for the excess phase and the alpha cut-off frequency can be used to determine accurately these quantities in a simple manner from the physics of the device and in the entire useful frequency range of the transistor. (Author)

AD-601 993 Div. 8, 30
OTS Price $2.75

Electronics Research Lab., Univ. of California, Berkeley.
NOTES ON SYSTEM THEORY, VOLUME V.
Apr 64, 121p ERL 64 8
Contract Nonr222 53; Grant AF AFOSR139 63

Unclassified report

Descriptors: (*Electronics, Scientific research), (*Scientific research, Electronics), Control systems, Inequalities, Electrical networks, Parametric amplifiers, Sequence switches, Communication theory, Special functions (Mathematical), Automata, Linear programming, Control, Theory, Stability.

Contents:
Digitalization of continuous control systems by M. A. Breuer
Some theorems on combining linear inequalities by M. A. Breuer
A conjecture on the properties RC-RL networks by D. A. Calahan
A gain-bandwidth limitation for an n-varactor parametric amplifier by M. Fukada
On the equivalence partitioning of linear modular circuits by A. Gill
A note on a correction to a result of Dobrushin by B. Gluss
A remark about invertible boolean functions, by M. A. Harrison
On the asymptotic number of automata by M. A. Harrison
Time-varying networks - the state variables and stability by E. S. Kuh
Sufficient conditions for the existence of a solution to a continuous linear programming problem and a corresponding duality theorem by A. Larsen
A minimal representation for a cascade of lattice networks by D. M. Layton and I. T. Frisch
Equilibrium, controllability and stability of N.P. F. M. control systems by T. Pavlidis
On the evaluation of optimal and non-optimal control strategies by E. Polak.

AD-601 994 Div. 8, 30
OTS Price $0.75

American Electronic Labs., Inc., Colmar, Pa.
DESIGN AND DEVELOPMENT OF SEMICONDUCTOR TEST SET, AN/USM-171( ).
Quarterly rept. no. 3, 1 Jan-31 Mar 64,
by W. R. Orloff and T. J. Ryan. 31 Mar 64, 24p
Contract DA36 039AMC03242E

Unclassified report

Descriptors: (*Test sets, Semiconductor devices), (*Semiconductor devices, Test sets), (*Circuit testers, Semiconductor devices), Diodes (Semiconductor), Transistors, Measurement, Electric currents, Circuits, Storage batteries, Power supplies, Portable, Construction, Design, Military requirements.

The AN/USM-171 Study and Design Plan phase delineated the feasibility of the approach for the Beta Measurement and Automatic Lead Selector. The major unknown was in-circuit leakage measurement. During the development and breadboarding in the first quarter, a significant breakthrough in the state-of-the-art measurement techniques for extracting the minute leakage current from the massive in-circuit shunt current was demonstrated. In the second quarter, a 10:1 improvement in leakage measurement capability was achieved. During this third quarter, an intensive design and breadboard verification test phase which concentrated on the emitter finding and low range leakage measurement circuits for the AN/USM-171 Test Set was accomplished. Final fabrication of the in-circuit probe using permanent tooling was accomplished and a value engineering analysis undertaken. (Author)

AD-602 080 Div. 8, 5
OTS Price $0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AUTOMATIC DOPPLER CONTROL FOR THE WEST FORD ANTENNA POINTING SYSTEM.
Group rept.
by J. E. Gillis. 25 Jun 64, 23p LL 1964 35
Contract AF19 628 500
ESD TDR64 342

Unclassified report

Descriptors: (*Doppler systems, Control systems), (*Command and control systems, Doppler systems), (*Parabolic antennas, Antenna components), Radio communication systems, Frequency converters, Oscillators, Automatic, Control.

An automatic doppler control system was added to the West Ford site. This system permits generation of local oscillator frequencies by use of a frequency synthesizer which is in turn driven by the normal West Ford Pointing System, local, analog pointing systems, or the Haystack-West Ford intersite coupling system. (Author)

AD-602 086 Div. 8, 25
OTS Price $1.50

General Electric Co., Syracuse, N. Y.
RADIATIVE INTERCONNECTIONS OF SOLID STATE CIRCUIT ARRAYS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 64,
by J. R. Barrett, G. E. Claflin, G. C. Gerhard, S. W. Ing, Jr., and H. A. Jensen. 31 Mar 64, 57p
Contract DA36 039AMC03279E, Proj. 3A99 21 003

Unclassified report

Descriptors: (*Semiconductor devices, Circuits), (*Photoelectric cells (Semiconductor), Circuits), Solid state physics, Gallium alloys, Arsenic alloys, Selenium, Low frequency, Medium frequency, Gain, Bandwidth, Photoconductivity, Photoelectric effect, Silicon, Measurement, Transistor amplifiers, Digital systems, Linear systems, Miniature electronic equipment, Impurities.

The wavelength response of several GaAs p-n emitters was measured at room temperature. The peak response was approximately 9050A, as expected. The results of measurements of the quantum efficiency of emitters, with use of both the old and new starting marterials, are presented. The results of quantum efficiency measurements with application of another measuring technique (integrating sphere) are presented and discussed. Directionality measurements are presented and discussed. Photoconductors in general are discussed and three basic models are analyzed, and compared with each other and with currently available phototransistors. Elementary design considerations for photoconductors are presented. Curently used photodetector fabrication methods are given and a new type of detector is shown. A microcircuit functin was selected and micro-logic was obtained; the circuit was built, and it was successfully demonstrated that a radiative interconnection channel can be made to work at room temperature with no special coupling media, with modest gain requirements. A discussion of this, along with photoconductor-transistor amplifier design considerations, is presented. (Author)

AD-602 088 Div. 8, 30
OTS Price $1.25

IIT Research Inst., Chicago, Ill.
ELECTRONIC EQUIPMENT CHARACTERISTIC RADAR TYPES-INSTRUMENTATION VAN.
Final rept, Vol. 2, 15 May 62-14 Feb 64
by Irving N. Mindel. 14 Feb 64, 45p
Contract DA36 039SC89102, Proj. E178,
Task 1G6 20501D44901

Unclassified report

Descriptors: (*Maintenance vehicles, Search radar), (*Radar equipment, Measuring devices (Electrical and electronic)), (*Measuring devices (Electrical and electronic), Radar equipment), S band, Radar receivers, Radar antennas, Checkout procedures, Parabolic antennas, Radiofrequency cables, Coaxial cables, Electrical equipment, Air conditioning equipment, Vehicles, Design, Specifications, Vibration isolators, Heaters, Installation, Storage, Instrumentation, Power supplies.

The objective of the program was to investigate the feasibility of determining the overall susceptibility of a radar system by means of independent measurement of the characteristics of the antenna, receiver, and transmitter portions of the system. The objective of the phase of the program discussed in this volume was to design and implement a mobile laboratory capable of performing these measurements. The mobile laboratory was implemented for making the antenna and receiver measurements on an "S" band search radar system. The design, implementation, checkout procedure, and operational instructions for this van are described in this volume. (Author)

AD-602 090 Div. 8
OTS Price $3.00

Coordinated Science Lab., Univ. of Illinois, Urbana.
CROSSED FIELD CHARGED PARTICLE DELAY LINES.
by H. G. Slottow. Jun 64, 176p CSL R-214
Contract DA28 043AMC00073E

Unclassified report

Descriptors: (*Crossed field devices, Delay lines), (*Delay lines, Crossed field devices), Electric fields, Magnetic fields, Helium, Ions, Electrons, Plasma physics, Space charges, Bandwidth, Velocity, Circuits, Pressure, Equations, Electron guns, Charged particles, Focusing, Electrodes, Oscillographs, Particle beams.

Crossed electric and magnetic fields are used to focus a beam of charged particles and to control the drift velocity of these particles. The novel and useful properties are: (1) the time delay can be varied continuously and rapidly; (2) the frequency band is potentially very wide. A discussion of the effects that limit bandwidth is presented and several means for reducing the limitations are described. In particular, a hyperboloidal structure is described that can maintain equal flight times in circular delay lines; the use of plasmas is discussed, and the field averaging properties of high energy electrons is analyzed. Experiments are described in which electrons or ions drifting at speeds less than 10,000 meters/second delay signals by as much as 50 microseconds. Results, usually in the form of oscillograms, show the effects of space charge, and in the case of tenuous plasmas, the effects of pressure on the shapes of video pulses. (Author)

AD-602 092 Div. 8
OTS Price $0.75

Westinghouse Electric Corp., Newbury Park, Calif.
ADVANCED PROCESSING TECHNIQUES FOR CAMERA TUBES.
Interim rept. no. 1, Feb-May 64
May 64, 29p
Contract AF33 615 1238

Unclassified report

Descriptors: (*Camera tubes, Manufacturing methods), Diodes, Photomultipliers, Photocathodes, Vacuum apparatus, Vacuum seals, Indium, Processing, Degasification, Tests, Electrodes.

An investigation was directed toward the following objectives: (1) Updating the tooling of the processing station. (2) Fabricating photodiode parts and tooling. (3) Processing and evaluation of photodiodes. (4) Fabricating photomultiplier parts and tooling. All process station modifications have been completed. Photodiode processing with S-20 and S-21 photo-

aluminum in an oxygen atmosphere gave best results if the oxygen pressure and deposition rate were controlled. The study of gaseous anodization was just begun, but preliminary results indicate it is quite useful for certain applications. A study was conducted of the feasibility of a controlled tunnel-emission triode. The complexity of the problem prevented a complete analytical treatment, but it was shown that the crucial problem was the maintenance of the required high input impedance while still controlling tunnel emission. The experimental phase of the program was seriously hindered by lack of suitable control over the geometry of the edges used in this structure. (Author)

AD-602 047 Div. 8
OTS Price $12.00

Howard Research Corp., Arlington, Va.
STANDARDIZATION ENGINEERING PRACTICES STUDY OF ELECTRONIC COMPONENT PARTS.
Final rept. for 1 Jul 62-20 Feb 64.
by A. Arnold Lawson. 15 Jun 64, 167p
Contract DA36 039sc90906, Task 804

Unclassified report

Rept on Effect of Weldable Lead Materials on Performance of Electronic Component Parts.

Descriptors: (*Electric terminals, Welds), (*Resistors, Electric terminals), (*Capacitors, Electric terminals), Standardization, Performance (Engineering), Electric wire, Specifications, Copper, Filaments, Degradation, Iron alloys, Capacitors, Composite materials, Coils, Transformers, Life expectancy, Failure (Mechanics), Nickel, Tests, Nickel alloys, Mechanical properties, Soldering.

Phase I of the study consisted of a survey of manufacturers of resistors, capacitors and inductors to determine needs and availability of component parts with weldable lead materials and the manufacturers of these components. Phase II consisted of designing and performing a series of tests for performance evaluation of the component parts to determine the effect of weldable lead materials on performance parameters. The majority of the units evaluated were manufactured with nickel A or dumet leads, while a limited number of types and styles with standard leads were used as a control. The following tests were considered as being affected by the change in lead material: (1) Life test, (2)Short term overload test, (3) Lead fatigue test, (4) Vibration test, (5) Shock test, and (6) Stability. The results of the tests of the weldable lead units were evaluated in an effort to determine their compliance with the applicable military specifications.

AD-602 050 Div. 8, 2
OTS Price $1.25

Army Electronics Research and Development Agency
Fort Monmouth, N. J.
ROCKET RADIOSONDE AN/DMQ-( ) (XE-1) (FOUR-CHANNEL PARALLEL TELEMETRY SONDE).
by Albert Ivins. Dec 63, 43p
Task 1A0 25001A126 02
AELRDL TR2382

Unclassified report

Descriptors: (*Radiosondes, Sounding rockets), (*Telemetering transmitters, Multiple operation), Meteorological instruments, Design, Ions, Density, Thermal conductivity, Pressure, Measurement, Thermistors, Modules (Electronic), Data transmission systems, Ground support equipment, Performance (Engineering), Tests.

This report describes the design and construction of Rocket Radiosonde Set AN/DMQ-( ) (XE-1). This sonde is radically different from other rocket sondes currently in use in that it provides four channels of simultaneous data, and features modular construction. Presently, an ion density sensor, a thermoconductivity pressure sensor, and two temperature sensors are included in this sonde. The ground data readout system is described. Laboratory tests show that this sonde is capable of continuous and reliable operation. It is easily handled in the field and prepared for flight. Four flight tests to date show potential good sonde performance and ground data-handling equipment sufficiency. (Author)

AD-602 053 Div. 8, 26
OTS Price $1.00

Westinghouse Electric Corp., Elkridge, Md.
PRODUCTION ENGINEERING MEASURE: TRANSISTOR (WX-4001), LOGIC GATE (WM-201), FLIP-FLOP (WM-202), AC BINARY (WM-213).
Quarterly rept. no. 3, 1 Jan-31 Mar 64,
by Hauw T. Go. 31 Mar 64, 35p
Contract DA36 039AMC03617E

Unclassified report

Descriptors: (*Transistors, Production), (*Gates (Circuits), Production), (*Relaxation oscillators, Production) (*Circuits, Microminiaturization (Electronics)), Reliability, Bonding, Silicon, Diffusion, Photochemistry, Tests, Aluminum, Oxides, Failure (Mechanics), Design, Encapsulation.

Research was conducted to improve production techniques to increase the reliability of the WX-4001 transistor, WM-201 logic gate, WM-202 flip-flop, and WM-213 ac binary. A systematic plan was initiated to improve the following processes: diffusion, photochemistry, assembly, encapsulation, and design.

AD-602 068 Div. 8
OTS Price $4.00

Payne (Charles) and Associates, Miami, Fla.
APPLICATION OF THE INTERACTING LAMINAR SHELL CONCEPT TO ANTENNAS AND OTHER GROUND ELECTRONIC SYSTEM SUPPORT STRUCTURES.
by Charles Payne, I. J. Waxman, and H. A. Palmer.
Jul 62, 287p
Contract AF30 602 2381, Proj. 4506, Task 45389
RADC TDR62 366

Unclassified report

Descriptors: (*Antennas, Sandwich construction), (*Structural shells, Antenna configurations), (*Reflectors, Parabolic antennas), Buckling (Mechanics), Automatic, Control systems, Wiring diagrams, Ground support equipment, Sandwich panels, Honeycomb cores, Stresses, Loading (Mechanics), Design, Model tests.

Interacting laminar shell construction is an arrangement of structural shells (laminar structural surfaces) permitting optimum utilization of high strength materials of exceptionally thin cross-section by inherent stabilization characteristics of the system. The range of applicability for the interacting laminar shell system of construction is for large spans and heavy loading. As applied to antenna structures, large steerable reflectors of excellent structural efficiency and, through the automatic curvature control system feature, of exceptional surface accuracy, may be constructed to function without radomes. This document provides the results of experimental stress analysis upon a model of an interacting laminar shell antenna structure, develops influence diagrams for design use, and gives preliminary designs for eight different antennas. (Author)

Subjects of investigation during this period were: A. Improving frequency stability of the 500Mc/s oscillator. B. Increasing bandwidth and power capacity of the multiplier doubling from 500 Mc/s to 1,000 Mc/s. C. Studies of a new type of multiplier tripling from 1,000 Mc/s to 3,000 Mc/s. The 500 Mc/s oscillator tuning range and stability meet the specifications. Also, the doubler from 500 Mc/s to 1,000 Mc/s is working within the demanded limits. Further investigations have to be made on the 500 Mc/s power amplifier to increase bandwidth and power output.

AD-602 149 Div. 8
OTS Price $0.75

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
EXPERIMENTAL INTEGRATED CIRCUITS FOR SWITCHBOARDS,
by Russell A. Gilson, Jere W. Hohmann and Albert L. Bramble. Apr 64, 21p
Task 1A0 13001A039 00
AELRDL TR2447

Unclassified report

Descriptors: (*Integrated circuits, Environmental tests), Silicon, Networks, Miniature electronic equipment, Multiplex, Transistors, Radiation damage, Cold environment, Hot environment, Packaging, Gain.

Selected silicon integrated circuits designed for switching and multiplexing equipments are investigated under severe temperature and nuclear environments. The amount of temporary and permanent damage is assessed and the circuits are given a comparative functional test with the discrete component circuits they were designed to replace. (Author)

AD-602 156 Div. 8, 26
OTS Price $0.50

McCoy Electronics Co., Mount Holly Springs, Pa.
INDUSTRIAL PREPAREDNESS MEASURE. MANUFACTURE OF GLASS HOLDER CRYSTAL UNITS CR-(XM-17)/U.
Quarterly progress rept. no. 8, 1 Oct-31 Dec 62. 31 Dec 62, 18p
Contract DA36 039sc81269

Unclassified report

Descriptors: (*Crystal holders, Manufacturing methods), (*Quartz resonators, Production), Design, Aging (Materials), Processing, Specifications, Glass seals, Crystals, Tests, Crystal oscillators.

Aging test measurements and problems involving the preproduction units are presented. Process specifications for the contract items are also included in this report. (Author)

AD-602 167 Div. 8
OTS Price $3.50

General Electric Co., Syracuse, N. Y.
DUPLEXER CU-551 ( )/U. DEVELOPMENT OF HIGH POWER MULTIPACTORS DUPLEXERS AND SWITCHES.
Final rept.
Jun 64, 242p
Contract AF30 602 1641, Proj. 4589, Task 45083
RADC TDR64 165

Unclassified report

Descriptors: (*Transmit-receive tubes, Ultrahigh frequency), (*Electronic switches, S band), Design, Microwave equipment, Space charges, Secondary emission, Tests, Life expectancy, Performance (Engineering), L-band.

This report summarizes the design criteria and high and low power testing data for an S-band duplexer, L-band duplexer, and an S-band switch. Developmental duplexers and switches are presented with a discussion of their advantages, their limitations, and their potential for future development. An extensive appendix is included, which deals with the space charge theory of the multipactor discharge and with the various aspects of the study of the multipactor phenomena. (Author)

AD-602 169 Div. 8, 25
OTS Price $1.00

Technical Research Group, Syosset, N. Y.
DEVELOPMENT OF A LOW-NOISE MILLIMETER-WAVE PARAMETRIC AMPLIFIER.
Quarterly progress rept. no. 3, 1 Jan-1 Apr 64,
by J. Kliphuis and D. Neuf. Apr 64, 33p
Contract DA36 039AMCO2365E, Proj. 1G6 22001A056

Unclassified report

Descriptors: (*Parametric amplifiers, Millimeter waves), (*Millimeter waves, Parametric amplifiers), (*Varactor diodes, Parametric amplifiers), Diodes (Semiconductor), Noise (Radio), Temperature, Gain, Bandwidth, Gallium alloys, Arsenic alloys, Microwave frequency, Waveguide circulators, Ferrites, Construction.

The self-resonant frequency of an unpackaged GaAs varactor die was measured and found to be 44 Gc. This result is encouraging because the optimum idler frequency required for minimum amplifier excess noise temperature is approximately 40 Gc. As a preliminary step in the development of a 94 Gc Y-junction circulator, a unit having a 7% bandwidth has been fabricated and tested at 35 Gc. The use of a laser beam welder appears to be a practical technique for bonding ribbons to extremely small mesa contacts, even after the die is etched. (Author)

AD-602 171 Div. 8, 25, 26
OTS Price $0.50

Keystone Controls Corp., Newark, N. J.
CRYSTAL UNIT CR-(XM-28)/U.
Quarterly progress rept. for Oct-Dec 63,
by James M. Ronan. Dec 63, 17p
Contract DA36 039sc81275

Unclassified report

Descriptors: (*Crystals, Semiconductor devices) (*Crystal holders, Manufacturing methods), Design, Specifications, Diodes (Semiconductors), Test methods, Bonding, Electrical conductance, Mechanical properties, Glass seals, Shock resistance, High frequency, Inductance.

Initial results obtained from the limited production equipment are discussed, and problems encountered are described. Specification data sheets are furnished, which lists all details of the crystal design. (Author)

AD-602 172 Div. 8,25, 26
OTS Price $0.75

Keystone Controls Corp., Newark, N. J.
CRYSTAL UNIT CR-(XM-28)/U.
Quarterly progress rept. for Jan-Mar 64,
by James M. Ronan. Mar 64, 26p
Contract DA36 039sc81275

Unclassified report

Descriptors: (*Crystals,Semiconductor devices), (*Crystal holders, Manufacturing methods), Very low frequency, Measuring devices (Electrical and Electronic), Diodes (Semiconductors), Standards, Performance (Engineering), Test equipment, Glass seals, Temperature, Shock resistance, Oscillators, Amplifiers, Frequency, Resistance (Electrical), Aging (Materials), Capacitors.

surfaces is currently underway. Diode evaluations have been initiated; however, insufficient data have been accumulated up to the present time to establish any reliable conclusions. (Author)

AD-602 093 Div. 8
OTS Price $0.75

Shockley Transistor Div., Clevite Transistor, Palo Alto, Calif.
NEW CONCEPTS FOR SOLID STATE MICROWAVE GENERATORS.
Quarterly rept. no. 5, 1 Jan-31 Mar 64
by R. M. Scarlett. 31 Mar 64, 27p
Contract DA36 039AMC00001E, Proj. DA3A99 21 001, Task 1G6 22001A056

Unclassified report

Descriptors: (*Semiconductor devices, Microwave generators), (*Microwave generators, Semiconductor devices), (*Diodes (Semiconductor), Electrical properties), Microwave equipment, Geometric forms, Resistance (Electrical), Gain, Errors, Transients, Impurities, Diffusion, Harmonic oscillators.E

Errors arising in measurements of negative resistance and current gain of transit-time devices are discussed. A new circular geometry for these devices is introduced. Although impro.od results were obtained, corrected measurements show that the negative resistance is just large enough to cancel the package and lead resistance. The power loss in PIN diodes operating as harmonic generators is considered. (Author)

AD-602 094 Div. 8, 26
OTS Price $0.50

Western Electric Co., Inc., Winston-Salem, N. C.
INDUSTRIAL PREPAREDNESS STUDY. LACQUER FILM CAPACITORS.
Quarterly progress rept. no. 21, 25 Feb-25 May 64,
by J. B. Rawls. 25 May 64, 19p
Contract DA36 039SC81268

Unclassified report

Descriptors: (*Capacitors, Environmental tests), Films, Varnishes, Carbonates, Dielectrics, Quality control, Temperature, Moisture, Life expectancy, Acceleration, Shock (Mechanics), Vibration, Capacitance, Encapsulation, Non-destructive testing, Tests, Polyester plastics.

Effort was directed toward the completion of the polycarbonate capacitor pilot run production and testing program. The capacitors successfully completed the contractor inspection organization, the contractor quality audit organizations and government quality audit inspection. Environmental tests were begun. The pilot run successfully completed the salt fog, temperature and immersion cycling, moisture resistance, capacitance change with temperature, life, shock and acceleration tests. The lot is being tested on vibration having been delayed due to the load on vibration equipment. (Author)

AD-602 099 Div. 8, 26
OTS Price $1.25

Weston Instruments and Electronics Div., Daystrom, Inc., Newark, N. J.
PRODUCTION FACILITIES FOR MULTI-TURN METAL-FILM TRIMMER RESISTORS PER SIGNAL CORPS TECHNICAL REQUIREMENTS SCS-127 DATED 9 FEBRUARY, 1962.
Quarterly progress rept. no. 6, 1 Oct-31 Dec 63
31 Dec 63, 50p
Contracts DA36 039SC86734

Unclassified report

Descriptors: (*Variable resistors, Manufacturing methods), Metal films, Resistance (Electrical), Wire, Specifications, Military requirements, Production, Test equipment, Tests.

Production manufacturing tooling was developed by producing preproductin units according to specified requirements. Production units were also made.

AD-602 111 Div. 8
OTS Price $0.75

Syracuse Univ. Research Inst., N. Y.
EFFECT OF SMALL DISCONTINUITIES ON THE INPUT VSWR OF A LONG TRANSMISSION LINE.
by Jose Perini. May 64, 23p
Contract AF30 602 2646, Proj. 4506, Task 450604
RADC TDR64 121

Unclassified report

Descriptors: (*Transmission lines, Phase distortion), (*Phase distortion, Transmission lines), Standing-wave indicators, Waveguides, Frequency, Bandwidth, Admittance, Communication systems, Equations, Reflection.

The high VSWR resulting from reflections from the many small discontinuities in long transmission lines or waveguides is discussed. Equations predicting the input VSWR dependence on frequency are calculated in an attempt to eliminate the problem. The transmission line approach is used.

AD-602 126 Div. 8
OTS Price $3.00

Republic Aviation Corp., Farmingdale, N. Y.
PRELIMINARY DESIGN STUDY OF A FLAT PLATE REFLECTOR AND SUPPORT UNIT.
Scientific rept. no. 1,
by Stanislaus Dubowski. Apr 64, 182p RAC 2135
Contract AF19 628 2995, Proj. 0000
AFCRL 64 286

Unclassified report

Descriptors: (*Antenna configurations, Optimization), Antennas, Antenna components, Metal plates, Reflectors, Supports, Hydraulic actuators, Specifications, Design, Costs.

Parametric studies were conducted for every component going into the plate system of the Multi-Plate Antenna. Cost analyses were made on combinations of techniques, tolerances, materials, fabrication, assembly and installation with respect to a choice of operating capabilities of the entire antenna system. The optimum system will consist of 2100 hexagon shaped plates, actuated hydraulically. Each plate will have an area of 900 sq. ft. and will operate satisfactorily in wind velocities up to 25 M. P. H. In the proposed Arizona location wind velocities are below this level 99.5% of the time. Numerous design and cost analyses are presented in graphical format to permit rapid trade-offs in selecting optimum systems. (Author)

AD-602 145 Div. 8, 25
OTS Price $0.50

Microwave Associates, Inc., Burlington, Mass.
SOLID-STATE GENERATOR.
Quarterly progress rept. no. 4, 1 Mar-30 Jun 64,
by E. Scherer. 30 Jun 64, 8p
Contract NObsr89356, Proj. SR008 03 01, Task 9391

Unclassified report

Descriptors: (*Radiofrequency generators, Semiconductor devices), (*Frequency multipliers, Ultrahigh frequency), (*Semiconductor devices, Radiofrequency generators), (*Radiofrequency oscillators, Ultrahigh frequency), Radiofrequency oscillators, Varactor diodes, Transistor amplifiers, Oscillator circuits, Bandwidth, Stability, S band, Microwave equipment.

fast mode is much lower; but attenuation is greater. Experimental study of the noise figure was carried out on two types of guns: a short space charge gun, and a gun with a screen-grid over cathode. In the first case, the noise figure is high and increases rapidly with current. The screen-gridded gun has a lower noise figure, of the order of 50 dB. (Author)

AD-602 267 Div. 8, 30
OTS Price $8.10

Raytheon Co., Waltham, Mass.
RESEARCH ON LOW NOISE CATHODE DEVELOPMENT.
Interim engineering rept. no. 4, 1 Feb-30 Apr 64,
by S. R. Steele, W. Getty, S. Mao, D. Bobroff, and P. Lindsay.
30 Apr 64, 84p Ray S660
Contract AF33 657 11003

Unclassified report

Descriptors: (*Electron guns, Traveling wave tubes), (*Cathodes (Electron tubes), Noise (Radio)), Test equipment (Electronics), Temperature, Measurement, Velocity, Electron density, Photocathodes, Design, Thermionic emission, Radiometers, Surface properties, Electron beams, Particle trajectories, Mathematical analysis, Low-temperature research.

The purpose of this program is to achieve thermionic or non-thermionic emission with a low noise temperature. A vehicle for measuring the effective noise temperature of cathodes has been tested. The method for changing cathodes appears to be satisfactory. A calibration has been obtained for the Dicke radiometer. A computer program has been formulated to assist in designing electron guns for use with narrow velocity-spread cathodes. This has been applied to two types of cathodes which have been suggested. Experiments have been conducted on cooled S-4 photocathodes. A tube has been designed that permits forming photosurfaces on surfaces that can be cooled to very low temperatures. Some preliminary tubes of this sort have been fabricated. A theoretical treatment of the velocity and the density distribution in a simple model of a low noise gun is being carried out with the help of a computer. (Author)

AD-602 270 Div. 8
OTS Price $2.00

Motorola, Inc., Scottsdale, Ariz.
MINIATURE THIN FILM INDUCTORS (MODIFICATION NO. 2).
Final development rept. for 27 May 63-27 May 64,
by F. R. Gleason. 30 Jun 64, 78p WF4003
Contract NObsr85397, Proj. SR00803, Task 9636

Unclassified report

Descriptors: (*Miniature electronic equipment, (Coils), (*Coils, Metal films), Films, Gold, Encapsulation, Ferrites, Nickel alloys, Zinc alloys, Cobalt alloys, Inductance, Sprays, Chlorides, Vapor plating, Evaporation, Electrodeposition.

The report describes a program directed toward the development of techniques for fabricating miniature thin-film inductors. The basic device consists of a flat spiral conducting path deposited on a bulk ferrite substrate and encapsulated with a ferrite film deposit. The goal of the program was to fabricate these inductances in a range from 38 to 1000 microhenries with a Q-value of 100 measured at 1 Mc. The technique for depositing the ferrite film by the spray hydrolysis of a chloride solution is described. The spiral coils were made from gold and deposited by a combination of vacuum evaporation and electrodeposition techniques. The maximum air core coil inductance obtained in an area 0.3 inch square was 1.8 microhenries. The largest inductance value obtained for a single encapsulated coil was 54 microhenries with a Q-value of 6 at 1 Mc. (Author)

AD-602 271 Div. 8, 26
OTS Price $1.75

Hamilton Standard Div., United Aircraft Corp.,
[Windsor Locks] Conn.
ENHANCED MICRO-MODULE INTERCONNECTIONS. AN HERMETIC PACKAGING SYSTEM FOR THE INTEGRATION OF MICRO CIRCUITS.
Quarterly rept. no. 3, 1 Jan-31 Mar 64.
Mar 64, 66p HSER 2884
Contract DA36 039AMC03620E

Unclassified report

Descriptors: (*Integrated circuits, Manufacturing methods), Microminiaturization (Electronics), Welding, Hermetic seals, Electroplating, Programming (Computers), Modules (Electronic), Fixed contacts, Seals (Stoppers), Electron beams, Failure (Mechanics), Packaging, Environmental tests, Vibration, Thermal stresses, Shock (Mechanics), Nickel, Copper, Automatic.

Six engineering model design enhanced micro-modules were assembled and submitted to environmental testing: thermal shock, vibration and mechanical shock. Engineering model design units were provided with microwafers with suitably shorted terminations which permit weld resistance monitoring during vibration and establishment of weld degradation, if any, after environmental testing. Several ten stage binary divider enhanced micro-modules were assembled up to the hermetic sealing step and found to be operative. Microwafers with either copper or nickel electroplated terminations were used extensively for the assembly of engineering model design and functional modules. In this type of pilot production environment it was observed that the yield with nickel terminated microwafers is considerably higher than with copper plated ones. The previously assembled machines were subjected to operational check-outs to establish compatibility with the overall process. The microwafer stack multiweld machine, as well as the can-header sealing machine, are in the process of being developed and integrated with the automatic wire programmer. (Author)

AD-602 284 Div. 8
OTS Price $0.75

Chatham Electronics Div., Tung-Sol Electric, Inc.,
Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR TYPE 7890 SUPER POWER HYDROGEN THYRATRON.
Quarterly progress rept. no. 8, 8 Dec 63-7 Mar 64,
by C. L. Shackelford. 7 Mar 64, 28p
Contract DA36 039sc85984

Unclassified report

Descriptors: (*Thyratrons, Manufacturing methods), Hydrogen, Life expectancy, Electron tube parts, Cooling, Performance (Engineering), Radiofrequency power, Design.

The loss of two tubes by failure of a reservoir heater led to a new reservoir assembly which is an improvement over the previous one. The cooling provisions for the grids are adequate for rated conditions but are marginal at the test conditions. Operation (2) life test was passed successfully. Vertical spacing greater than desirable did not cause grid firing characteristics to go beyond specification limits. (Author)

All frequency measurements are compared to the primary standard, which can be traced to the National Bureau of Standards. The system employed is discussed. The results of the tests performed on the preproduction samples are tabulated. (Author)

AD-602 223 Div. 8, 5, 15
OTS Price $17.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE THEORY OF RANDOM PROCESSES AND ITS APPLICATION IN RADIO ENGINEERING. PART I,
by B. R. Levin. Mar 60, 264p
FTD F TS 9811 P1, TT 60 23871 1

Unclassified report

Trans. of mono. Teoriya Sluchainykh Protsessov i Ee Primenenie v Radiotekhnike, Moscow, 1957, chaps. 1-6.

Descriptors: (*Statistical processes, Communication theory), (*Communication theory, Statistical processes), (*Radio equipment, Engineering), Probability, Statistical functions, Statistical distributions, Measure theory, Transformations (Mathematics), USSR.

Contents:
Fundamental aspects of the theory of probability
Laws of probability distribution of random variables
Functions of continuous random variables
Limiting theorems
Random processes
Transformations of random processes.

AD-602 224 Div. 8, 5, 15
OTS Price $15.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE THEORY OF RANDOM PROCESSES AND ITS APPLICATION IN RADIO ENGINEERING. PART II,
by B. R. Levin. Mar 60, 230p
FTD F-TS9811 P2; TT 60 23871 2

Unclassified report

Trans. of mono. Teoriya Sluchainykh Protsessov i Ee Primenenie v Radiotekhnike, Moscow, 1957, chaps. 7-11 and appendices.

Descriptors: (*Statistical processes, Communication theory), (*Communication theory, Statistical processes), (*Radio equipment, Engineering), Transformations (Mathematics), Statistical functions, Signals, Pulse modulation, USSR.

Contents:
Nonlinear transformations of the normal random process
Statistical characteristics of the envelope and phase of a normal random process
Passage of normal random process through standard radio equipment sections
Power spectra of signals, modulated by random processes
Elements of information theory.

AD-602 237 Div. 8
OTS Price $1.25

Washington Univ., Seattle, Coll. of Engineering.
THINNING AND BROADBANDING ANTENNA ARRAYS BY UNEQUAL SPACINGS.
Technical rept. no. 83,
by Akira Ishimaru and Y-S. Chen. Mar 64, 42p
Contract AF19 628 2763, Proj. 5635, Task 563502
AFCRL 64 253

Unclassified report

Descriptors: (*Antennas, Design), (*Antenna radiation patterns, Theory), Antenna lobes, Broadband, Bandwidth, Gain.

The paper presents a theory for, and a method of designing a thinned or broadband antenna array by means of unequal spacings. Using the theory of unequally spaced arrays developed by one of the authors, an antenna array can be designed to produce a desired beamwidth and sidelobe level with the average spacing many wavelengths apart. The patterns are expressed in a series of the Anger functions and its sidelobe level is shown to decrease approximately as N to the minus 0.4th power where N is the total number of elements, and the gain is approximately equal to N. It is also shown that the sidelobe level can be improved by varying the amplitude distribution. Numerical examples are given to illustrate the method. (Author)

AD-602 253 Div. 8
OTS Price $2.00

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER BEAM-PLASMA AMPLIFIER.
Quarterly progress rept. no. 5, 15 Dec 63-14 Mar 64,
by M. A. Allen, C. S. Biechler, P. Chorney, and H. S. Maddix.
14 Mar 64, 80p
Contract DA36 039AMC 00076E, ARPA Order 331 62,
Task 7776 10 331 28

Unclassified report

Descriptors: (*Plasma physics, Electron beams), (*Electron beams, Plasma medium), (*Radiofrequency amplifiers, Design), Electrons, Density, Velocity, Modulation, Programming (Computers), Probes (Electromagnetic), Xenon, Gases, Waveguide couplers, Klystrons, Modulators, Cavity resonators.

Efficiency predictions obtained from the large signal computer theory are given. A Langmuir probe plasma mapping vehicle is described and results given. A coupling experiment showing 20 db of coupling enhancement due to the plasma is disucssed and the design of a second amplifier tube presented. (Author)

AD-602 261 Div. 8
OTS Price $2.25

Centre de Physique Electronique et Corpusculaire, Orsay (France).
RESEARCH ON NOISE IN CROSSED FIELD DEVICES.
Final rept.,
by F. Diamand. Mar 64, 100p WR-1178
Contract DA91 591EUC2525

Unclassified report

Descriptors: (*Microwave amplifiers, Crossed field devices), (*Crossed field devices, Noise), (*Electron guns, Noise), Electron tubes, L band, Oscillation, Electron beams, Noise (Radio), Gain, Bandwidth, Attenuation, Cathodes (Electron tubes), Space charges, Transmission lines, France.

The program of work was to develop a C.W. TPOM in order to study noise and spurious oscillations, seeking especially to reduce the amplitude of these parasitic phenomena. The first object was to realize a linear L-band tube of an experimental type, with the following features: 20 dB gain for a current of about 100 mA; applied power up to 1 kW; delay ratio of the order of 20. Two sorts of lines were studied: an interdigital line working on the direct space harmonic m=+1, and a meander line brazed on alumina slabs. It was found that the meander line has some obvious advantages as compared to the interdigital line: the band width is wider; coupling resistance is higher, with a smaller variation over the band; matching is easier; coupling to the

9. FLUID MECHANICS

AD-601 730 Div. 9, 25
OTS Price $0.50

Cornell Univ., Ithaca, N. Y. Graduate School of Aerospace Engineering.
FINAL REPORT (AEROSPACE ENGINEERING: GAS DYNAMICS).
Rept. for 1 May 62-30 Apr 64,
by W. R. Sears. 15 Jun 64, 3p
Grant AF AFOSR62 201
AFOSR 64 1138

Unclassified report

Descriptors: (*Magnetohydrodynamics, Gas flow), (*Super-aerodynamics, Gas flow), Gases, High-temperature research, Plasma physics, Fluid flow, Chemical reactions, Reviews, Bibliographies.

Summaries are given of researches in the following fields: magneto-dynamics of high-temperature gases; gasdynamics of real and chemically reacting gases; and dynamics of rarefied gases. A bibliography is given of the 15 publications generated under this grant.

AD-601 756 Div. 9
OTS Price $26.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
LAMINAR BOUNDARY LAYER.
by L. G. Loitsyanskii. 7 May 64, 573p
FTD TT63 749, TT 64 19165

Unclassified report

Unedited rough draft trans. of mono. Laminarnyi Pogranichnyi Sloi, Moscow, 1962, 479p.

Descriptors: (*Laminar boundary layer, Theory), (*Incompressible flow, Boundary layer), Gas flow, Three-dimensional flow, Hypersonic flow, Supersonic flow, Motion, Mathematical analysis, Shock waves, Conical nozzles, Fluid flow, Pressure.

Contents: The Prandtl equations and the simplest cases of their exact solution; Exact solutions for the Prandtl equations for certain classes of problems; Approximate one parameter methods; The plane nonsteady boundary layer; Nonflat two-dimensional boundary layers; Three-dimensional axisymmetric boundary layers; Some problems in the theory of a three-dimensional boundary layer; The boundary layer in a homogeneous or heterogeneous gas at high velocities; Thermal and diffusion boundary layers in an incompressible fluid; The laminar boundary layer on a plate in a longitudinal gas stream; Boundary layer with constant pressure; and The boundary layer in the case of a given distribution of pressures at the outside edge.

AD-601 779 Div. 9
OTS Price $2.25

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THE STABILITY OF LAMINAR INCOMPRESSIBLE BOUNDARY LAYERS IN THE PRESENCE OF COMPLIANT BOUNDARIES,
by Richard E. Kaplan. Jun 64, 89p ASRL TR116 1
Contract Nonr1841 89, Proj. RR009 01 01

Unclassified report

Descriptors: (*Laminar boundary layer, Stability), (*Numerical methods and procedures, Fluid mechanics), Incompressible flow, Fluid flow, Shear stresses, Boundary layer transition, Boundary layer control, Surface area, Solids, Jets, Wake, Boundary value problems, Reynolds number, Fluid dynamic properties, Numerical analysis.

A numerical technique has been developed for the solution of the Orr-Somerfeld equation for a boundary layer flowing over a general class of compliant boundaries. Sample calculations are worked out in detail for several types of models of compliant boundaries. It is shown that a compliant boundary can have a significant influence on the stability of the laminar boundary layer, both by delaying the appearance of unstable disturbances until higher values of the Reynolds number and by reducing the total spatial amplification of any frequency band. The methods are described in detail, including an outline of a technique to reduce the parasitic errors that occur in the numerical integration of certain types of differential equations.

AD-601 804 Div. 9, 12
OTS Price $2.75

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
PRESSURE AND HEAT TRANSFER MEASUREMENTS FOR MACH 8 FLOWS OVER A BLUNT PYRAMIDAL CONFIGURATION WITH AERODYNAMIC CONTROLS. PART III: HEAT TRANSFER DATA FOR DELTA WING SURFACE.
by Louis G. Kaufman, II. May 64, 127p
Contract AF33 616 8130, Proj. 8219, Task 821902
FDL TDR64 2P3

Unclassified report

Descriptors: (*Heat transfer, Delta wings), (*Aerodynamic configurations, Aerodynamic characteristics), Boost-glide vehicles, Re-entry vehicles, Aerodynamic heating, Hypersonic flow, Angle of attack, Flaps, Aerodynamic control surfaces, Trailing control surfaces, Canard configuration, Models (Simulations), Hypersonic wind tunnels, Blunt bodies.

The report presents heat transfer data obtained in the AEDC 50-inch Mach 8 tunnel on the lower surface of a blunt pyramidal configuration having remotely controlled trailing edge flaps.

AD-601 805 Div. 9, 12
OTS Price $3.00

Gruman Aircraft Engineering Corp., Bethpage, N. Y.
PRESSURE MEASUREMENTS FOR MACH 8 FLOWS OVER EXPANSION CORNERS AND RAMPS ON AN INTERNALLY COOLED MODEL. PART III. FLOWS OVER FULL SPAN RAMPS MOUNTED ON A FLAT PLATE.
by Louis G. Kaufman, II. May 64, 159p
Contract AF33 616 8130, Proj. 8219, Task 821902
RTD TDR63 4044P3

Unclassified report

Descriptors: (*Aerodynamic control surfaces, Hypersonic flow), (*Flat plate models, Aerodynamic characteristics), Trailing control surfaces, Aerodynamic heating, Cooling, Reynolds number, Angle of attack, Hypersonic wind tunnels, Surface temperatures, Re-entry vehicles, Boost-glide vehicles.

The report presents data obtained on the upper, flat plate, surface of the model and on the face of a 25% chord, full span, ramp mounted on the trailing edge of the flat plate. Data were obtained for three ramp angles, both with and without internal cooling of the flat plate surface, for model angles of attack from -43 to +10 degrees for free stream Reynolds numbers per foot of 1.1, 2.2 and 3.3 million.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-602 285 Div. 8
OTS Price $1.25

Thermo Electron Engineering Corp., Waltham, Mass.
THERMIONIC CONVERTER LIFE AND REPEATABILITY INVESTIGATION.
Quarterly progress rept. no. 2, 1 Apr-30 Jun 64,
by C. Z. Kamien. 30 Jun 64, 48p TE 4-65
Contract AF33 615 1348, Proj. 8173, Task 817305 30
Unclassified report

Descriptors: (*Thermionic converters, Life expectancy), Vacuum apparatus, Tests, Test equipment (Electronics), Cesium, Temperature, Voltage, Cooling, Electrodes, Experimental data, Electron guns.

Efforts included the fabrication and test of two Series 400 thermionic converters and the fabrication of two additional converters. The testing of converter prototype 401-P-1 yielded an output of 13 watts at 0.7 volt (6.5 watts/sq. cm.). The results of repairable converter prototype 402-R-1 are 30 watts at 0.7 volt (15watts/sq. cm.). The gas sampling unit was completed and checked out. The first four life-test setups was completed, and the description of the unit is presented. (Author)

AD-602 286 Div. 8
OTS Price $3.00

Microwave Lab., Stanford Univ., Calif.
ON THE ANALYSIS AND SUPPRESSION OF OSCILLATIONS IN HIGH-POWER TRAVELING-WAVE TUBES.
Jun 64, 194p
Contract AF30 602 2575, Proj. 5573, Task 557303
RADC TDR64 172
Unclassified report

Descriptors: (*Traveling wave tubes, Stability), (*Microwave equipment, Traveling wave tubes), Gain, Bandwidth, Theory, Backward-wave oscillators, Amplifiers, Waveguides, Frequency, Voltage, Circuits, Integral equations, Differential equations, Electron beams, Coupling circuits, Propagation, Resonance, Cavity resonators, Oscillation.

The primary purpose of this study was to examine the question of stability in high-power TWT's, both as to the concepts and the theoretical description of the possible types of instabilities (oscillations) that can occur and as to the possible schemes for making the tube stable (oscillation suppression schemes). The questions of gain, bandwidth, and efficiency were only considered peripherally in connection with the evaluation of certain oscillation suppression schemes.

AD-601 996 Div. 9
OTS Price $0.75

Brown Univ., Providence, R. I. Div. of Applied Mathematics.
ONSET OF CONVECTION IN A RAPIDLY ROTATING FLUID SPHERE.
Technical rept. no. 57,
by F. E. Bisshopp and P. P. Niller. Jun 64, 28p
Contract Nonr562 07, Proj. NR062 179

Unclassified report

Descriptors: (*Convection, Hydrodynamics), Rotation, Spheres, Liquids, Thermodynamics, Gravity, Stability, Coriolis effect, Boundary layer, Configuration, Equations, Numerical analysis.

The nature of the constraint imposed by rapid rotation on convective motions at their onset in a plane liquid layer can be found out from an exact solution of the problem. Here we use the physical insight derived from the simpler problem to formulate an asymptotic approximation to the equations governing the analogous problem in a sphere. The solutions we obtain for the asymptotic equations provide an asymptotic approximation of the dependence of the critical Rayleigh number for the onset of convection on the Taylor number. (Author)

AD-602 000 Div. 9, 25, 30
OTS Price $5.00

Harry Diamond Labs., Washington, D. C.
PROCEEDINGS OF THE FLUID AMPLIFICATION SYMPOSIUM, VOLUME I. SPONSORED BY THE HARRY DIAMOND LABORATORIES, 26-28 MAY 1964.
May 64, 395p
AD 601 499

Unclassified report

Descriptors: (*Amplifiers, Symposia), (*Hydraulic systems, Symposia), (*Liquid jets, Amplifiers), (*Symposia, Hydraulic systems), Fluid flow, Turbulence, Computer logic, Jet mixing flow, Two-dimensional flow, Shock waves, Noise, Resonators, Hydrodynamics, Pneumatic systems, Filters (Fluid), Gain.

Contents: Viscous dissipation of energy in free turbulent flows occurring in fluid amplifier operation; Curved turbulent mixing important in fluid amplifiers and fluid logic devices; Interacting underexpanded jet flows; Spreading rates of compressible two-dimensional reattaching jets; Interaction of oblique shocks and expansion waves with a jet boundary mixing zone; Separated flow in curved channels; Jet interaction noise; Deflection and relative flow of three interacting jets; Noise reduction by jet-edge and resonator coupling; Hydrodynamic study of the free-jet class of fluid-jet amplifiers; Wall reattachment device with pulsed control flow; Limitations of pure fluid elements; Stability of fluid systems; Low-pass filters for pneumatic amplifiers; Acoustic control of pneumatic digital amplifiers; Basic requirements for an analytical approach to pure fluid control systems; Response of a bistable fluid amplifier to a step input; Effect of geometric changes upon the switching point in a model bi-stable fluid amplifier; Flow field characteristics in a model bi-stable fluid amplifier; High gain proportional fluid state flow amplifier.

AD-602 001 Div. 9, 25, 30
OTS Price $6.00

Harry Diamond Labs., Washington, D. C.
PROCEEDINGS OF THE FLUID AMPLIFICATION SYMPOSIUM, VOLUME II. SPONSORED BY THE HARRY DIAMOND LABORATORIES, 26-28 MAY 1964.
May 64, 485p
AD 601 500

Unclassified report

Descriptors: (*Amplifiers, Symposia), (*Hydraulic systems, Symposia), (*Liquid jets, Amplifiers), (*Symposia, Hydraulic systems), Modulators, Valves, Control systems, Computer logic, Pneumatic systems, Turbines, Analog systems, Coding, Steam turbines, Speed regulators, Hydrofoils, Timing devices.

Contents: Impact modulator; direct and transverse impact; Control characteristics of vortex valves; Proportional vortex fluid amplifier; Vortex fluid throttle; Counter-vortex oscillators; Application techniques for proportional pure fluid amplifiers; Static design of pneumatic logic circuits; Application of pure fluid logic to on-off control systems; Analysis of fluid amplifier design; Turbulence amplifier in control systems; Multiple-ball pneumatic amplifiers; Staging of pressure proportional amplifiers; Proportional fluid amplifier for multi-stage operation; Analog computation with fluids; Fluid encoding system; Fluid amplifier steam turbine speed control; Applications of pure fluid techniques to a speed control; Pure fluid hydrofoil control system; Experimental development of a hot gas valve; Two pure fluid timers.

AD-602 002 Div. 9, 25, 30
OTS Price $3.50

Harry Diamond Labs., Washington, D. C.
PROCEEDINGS OF THE FLUID AMPLIFICATION SYMPOSIUM, VOLUME III, SPONSORED BY THE HARRY DIAMOND LABORATORIES, 26-28 MAY 1964.
May 64, 213p
AD 601 501

Unclassified report

Descriptors: (*Amplifiers, Symposia), (*Hydraulic systems, Symposia), (*Liquid jets, Amplifiers), (*Symposia, Hydraulic systems), Oscillators, Pneumatic systems, Nozzles, Gain, Turbines, Bibliographies.

Contents: Transient behavior of bistable fluid elements; Sonic oscillator; Interconnection of fluid amplification elements; Staging of closed porportional fluid amplifiers; Angular velocity regulation with a fluid interaction system; Fluid amplification technology bibliography.

AD-602 046 Div. 9
OTS Price $1.00

Institute of Engineering Research, Univ. of California, Berkeley.
THE STABILITY OF VISCOUS FLOW BETWEEN ROTATING CYLINDERS IN THE PRESENCE OF RADIAL TEMPERATURE GRADIENT.
by Paul Lieber and Lionel Rintel. Nov 62, 35p
MD-63-5
Contract Nonr222 87

Unclassified report

Descriptors: (*Fluid flow, Stability), (*Cylindrical bodies, Transport properties), (*Differential equations, Perturbation theory), Temperature, Viscosity, Convection, Coriolis effect, Centrifugal fields, Heat transfer, Numerical analysis, Fluid mechanics.

The differential equations for small perturbations of the basic viscous and heat flows in the problem indicated are derived, and the critical conditions are obtained for a number of cases, each treated in a separate section. The results obtained elucidate the physical equivalence of the viscous and thermal causes of instability and establish the effect of their interaction on instability in terms of an interaction parameter. It is thus found that transitions, which can be individually produced by separately applying velocity or temperature gradients, are strongly conditioned by the interaction of these gradients when applied simultaneously. (Author)

Division 9 - FLUID MECHANICS

AD-601 848 Div. 9, 1
OTS Price $2.00

Vidya Div., Itek Corp., Palo Alto, Calif.
THEORETICAL AERODYNAMICS OF FLEXIBLE WINGS AT LOW SPEEDS: II - TWO-LOBED PARAWINGS.
by Jack N. Nielsen, Richard Barakat, Frederick K. Goodwin and Morton Rudin. 1 May 64, 75p Vidya 133
Contract Nonr3728 00, Proj. 9064
Unclassified report

Descriptors: (*Parawings, Aerodynamic characteristics), (*Wings, Flexible structures), Subsonic characteristics, Slender bodies, Aerodynamic configurations, Aerodynamic loading, Lift, Angle of attack, Data, Tables, Graphics, Equations, Numerical analysis.

On the basis of slender-body wing theory, the geometric and aerodynamic characteristics of two-lobed parawings are completely determined. Such wings have a vertical plane of symmetry and possess a cusp at the root chord at the same elevation as the leading edges. By superposing the two-lobed solutions with previously determined one-lobed solutions, it is possible to determine the properties of parawings in which the root chord (keel) is not at the same elevation as the leading edges. As examples of such parawings, the family of parawings with no leading-edge singularity is determined and the effectiveness of changes of keel incidence for the production of lift is calculated. Tabular data for use in aerodynamic design are presented together with several calculative examples. (Author)

AD-601 908 Div. 9
OTS Price $1.50

Hydronautics, Inc., Laurel, Md.
NON-STEADY HYDRODYNAMIC CHARACTERISTICS OF A SUPERCAVITATING HYDROFOIL UNDER A FREE SURFACE,
by C. C. Hsu. Apr 64, 52p Hydro TR463 2
Contract NObs90224, Proj. SS600 000, Task 1701
Unclassified report

Descriptors: (*Hydrofoils, Fluid dynamic properties), Cavitation, Oscillation, Pitch (Motion), Lift, Moments, Flutter, Equations, Numerical analysis, Data, Graphics.

The present report is a sequel to an earlier report (AD-601 100). The principal interest here is to clarify, both qualitatively and quantitatively, the influence of a free-surface on the non-steady two-dimensional hydrodynamic characteristics of supercavitating hydrofoils. Heaving, pitching, and flapping motions are considered. It is found that, in general, the added mass forces and moments depend only slightly on the submergence depthchord ratio of the hydrofoil. However, the other non-steady forces and moments vary appreciably with the depth of submersion. At a depth-chord ratio of unity (typical value) the non-steady characteristics are not well approximated by either the deeply submerged or surfaced hydrofoil results. The prediction of hydrofoil flutter or of transient foil or flap response will thus depend very much on the hydrofoil submergence. Detailed numerical results for unsteady response, based on digital machine calculation, are given. (Author)

AD-601 963 Div. 9, 4, 25
OTS Price $1.50

Aerospace Corp., Los Angeles, Calif.
EXTENSION OF BELOTSERKOVSKII'S DIRECT METHOD TO REACTING GAS IN THERMODYNAMIC EQUILIBRIUM,
by S. T. Chu. 18 May 64, 55p TDR-269 4560 10 3
Contract AF04 695 269
SSD TDR64 81
Unclassified report

Descriptors: (*Two-dimensional flow, Thermodynamics), (*Gas flow, Thermodynamics), (*Chemical equilibrium, Gas flow), Shock waves, Differential equations, Blunt bodies, Ellipsoids, Spheres, Supersonic flow, Hypersonic flow, Chemical reactions.

Belotserkovskii's integral method of analyzing the flow field behind the curved shock about a blunt body is extended to cover cases of (1) arbitrary blunt body in two-dimensional or axisymmetric flow, and (2) real gas in thermodynamic equilibrium. Detailed derivation is given for the simple case of linear interpolation. Extension to third order interpolation is also treated with a different but simpler scheme in that the shock layer is not subdivided into strips as in the original work of Belotserkovskii. The resulting differential system for the high order analysis consists of only three total differential equations, two of which are of the second order. Numerical results are presented on the basis of the first order theory for flow field about spherical and ellipsoidal noses. Shock detachment distances obtained for the spherical nose are consistent with those obtained by using the Gravalos method. Significant differences exist between the results of real gas and those of perfect gas analyses. (Author)

AD-601 976 Div. 9, 30
OTS Price $0.75

University of Southern California, Los Angeles. Engineering Center.
SUPERSONIC WIND TUNNEL INVESTIGATION OF THE TURBULENT BOUNDARY LAYER ON AXIALLY SYMMETRIC BODIES.
by Thomas H. Keesee. 27 Mar 63, 23p USCEC 65 52
Unclassified report

Descriptors: (*Turbulent boundary layer, Axially symmetric flow), (*Supersonic wind tunnels, turbulent boundary layer), Asymmetric bodies, Wind tunnel models, Heat transfer, Surface area, Friction, Pressure, Data processing systems, Aerodynamics, Equations, Mechanical drawings.

This report describes a supersonic wind tunnel investigation of the turbulent boundary layer on three axially symmetric bodies at freestream Mach numbers of 1.61, 2.58, 3.30, and 4.50. Steady state temperature and pressure measurements were made in the boundary layers and on the surfaces of bodies that featured convex, concave, and blunt-convex-shouldered geometries, and transient temperature measurements were made on the surface of a convex-shouldered model that had been cooled with liquid nitrogen. Skin-friction measurements were also made with a floating-element balance. Descriptions of the models, instrumentation and test program, and a discussion of the difficulties encountered in making some of the measurements are presented. (Author)

AD-601 985 Div. 9, 30
OTS Price $1.50

Aerospace Corp., Los Angeles, Calif.
EXPERIMENTAL INVESTIGATION OF THE STABILITY OF INTERNALLY PRESSURIZED CONICAL SHELLS UNDER TORSION.
by V. I. Weingarten. 8 Jun 64, 55p TDR-269 4560 40 1
Contract AF04 695 269
SSD TDR64 14
Unclassified report

Descriptors: (*Conical bodies, Stability), Materials, Polyester plastics, Deformation, Loading (Mechanics), Shear stresses, Elasticity, Numerical analysis, Test methods, Tests, Experimental data, Tables, Graphics.

From an analysis of the buckling of conical shells under external pressure, torsion, and axial compression, numerical values are obtained of the critical torsional loads of selected internally pressurized conical shells. These values are compared with experimental results. No simple expression for the interaction curve between torsion and internal pressure was found for conical shells. (Author)

Descriptors: (*Hemispherical shells, Blast), (*Blast, Hemispherical shells), Reentry vehicles, Models (Simulations), Instrumentation, Test methods, Explosion effects, Loading (Mechanics), Pressure, Strain (Mechanics), Measurement, Experimental data.

Pressure-Time Histories and Strain Time Histories are presented for two free-air blast over-pressures on combination conical and cylindrical thin walled shells. (Author)

AD-602 240 Div. 9, 4, 25
OTS Price $2.00

Aerospace Corp., [Los Angeles], Calif.
ON THE STRUCTURE OF A RADIATION-RESISTED SHOCK IN A SIMPLE DISSOCIATING GAS.
by Inge Ryhming. 15 May 64, 74p TDR-269 4230 20 7
Contract AF04 695 269
SSD TDR64 47

Unclassified report

Descriptors: (*Hypersonic flow, Shock waves), (*Shock waves, Hypersonic flow), Thermal radiation, Gases, Oxygen, Dissociation, Reaction kinetics, Thermodynamics, Field theory, Differential equations, Integral equations.

The structure of a radiation-resisted hypersonic shock in a simple dissociating gas is studied by using the quasi-equilibrium theory in obtaining the radiation field. The continuous absorption coefficient of the molecules is evaluated from a wave mechanical model developed previously. The basic equations of the problem reduce to a coupled set of integral and differential equations for the velocity and the degree of dissociation. Properties of the structure are found from a study of these equations around the end points in a phase diagram. For quantitative predictions, actual data for the reaction rate constant and the absorption continuum for oxygen are used. It is found that a net amount of radiant energy is transferred from the region immediately behind the shock to the region upstream and further downstream of the shock. This result is a consequence of treating the gas as non-grey. If the gas is taken to be grey, another flow configuration is found. The effect exerted by the radiation on the flow is small for the particular shocks investigated (shock Mach number less than twenty in oxygen and free stream pressure ranging from one to ten mm Hg). (Author)

AD-602 268 Div. 9, 27
OTS Price $8.60

Brown Engineering Co., Inc., Huntsville, Ala.
NUMERICAL ANALYSIS OF PLUG NOZZLES BY THE METHOD OF CHARACTERISTICS.
Technical note,
by C. C. Lee and S. J. Inman. May 64, 96p BrownEng R101
Contract NAS8 5289

Unclassified report

Descriptors: (*Plug nozzles, Numerical analysis), (*Supersonic flow, Numerical analysis), (*Numerical analysis, Programming (Computers)), Nozzle gas flow, Axially symmetric flow, Equations of state, Partial differential equations, Continuum mechanics, Boundary value problems, Transonic flow, Performance (Engineering).

This report describes the theory used to calculate supersonic flow in plug nozzles and the computer program based on this theory. Flow properties are calculated by the method of characteristics. Sauer's transonic theory is used to determine the starting line and Korst's technique is used to calculate the base pressure. (Author)

AD-602 269 Div. 9, 1
OTS Price $11.00

Vidya Div., Itek Corp., Palo Alto, Calif.
THEORETICAL INVESTIGATION OF STATIC COEFFICIENTS, STABILITY DERIVATIVES, AND INTERFERENCE FOR DUCTED PROPELLERS.
by A. R. Kriebel. 31 Mar 64, 148p Vidya 112
Contract NOw62 0129c, Proj. 9063

Unclassified report

Descriptors: (*Shrouded propellers, Aerodynamic characteristics), Thrust, Vertical take-off planes, Hovering, Axially symmetric flow, Ring wings, Aerodynamic loading, Stability, Angle of attack, Pitch (Motion), Propellers (Aerial), Mathematical prediction, Theory.

The force and moment coefficients at angle of attack and their dynamic pitching derivatives are predicted by potential flow analysis for an isolated ducted propeller. The analysis is based upon Fourier expansion of the vorticity distribution and makes use of the previous theoretical results for ring wings at angle of attack and ducted propellers in axial flow. The present results extend those derived in detail in (AD-403 146) for a short thin cylinder surrounding a uniformly loaded actuator disk. Although the actuator disk assumption is retained, the effects of large duct chord-to-diameter ratio, and the effects of duct camber, taper, and thickness are shown on the duct coefficients and their pitching derivatives. (Author)

AD-602 116 Div. 9
OTS Price $1.00

David Taylor Model Basin, Washington, D. C.
AN EXPERIMENTAL INVESTIGATION OF THE RELATION BETWEEN SKIN FRICTION AND HEAT TRANSFER ON THE SURFACE OF A SPHERE AT SUPERSONIC SPEEDS. PART I. PRESSURE DISTRIBUTION AND BOUNDARY LAYER MEASUREMENTS ON A SPHERE.
by Richard M. Hartley, Ernest E. Harley, and Michael J. Malia, Jr. May 64, 37p
DTMB Aero-1054

Unclassified report

Descriptors: (*Spheres, Supersonic characteristics), (*Supersonic characteristics, Spheres), Boundary layer, Measurement, Barometric pressure, Distribution, Heat transfer, Drag, Balances, Design, Aerodynamic heating.

In order to design a balance mechanism capable of measuring the skin-friction drag on a small surface element of a sphere subjected to supersonic flow, it was necessary to determine the order of magnitude of the skin-friction and pressure loads on such an element. To this end, wind tunnel tests were conducted, principally at a Mach number of 2.86, on a 3-inch-diameter sphere (and hemisphere) to measure the boundary-layer characteristics at one point and to determine the pressure distribution. From these measurements, approximate maximum steady-state friction and pressure loads were determined which will be used as starting points for the design of a skin-friction balance. (Author)

AD-602 162 Div. 9
OTS Price $0.50

Aerospace Corp., San Bernardino, Calif.
AIR IONIZATION IN THE HYPERSONIC LAMINAR WAKE OF SHARP CONES,
by F. L. Fernandez and E. S. Levinsky.
10 Jun 64, 15p TDR-269 S4811 20 1
Contract AF04 695 269
BSD TDR64 81

Unclassified report

Descriptors: (*Hypersonic flow, Gas ionization), (*Gas ionization, Hypersonic flow), Air, Laminar flow, Wake, Slender bodies, Conical bodies, Scale, Boundary layer, Enthalpy, Reentry vehicles.

A simplified analysis is proposed for determining peak ionization in the hypersonic laminar wake of slender cones, and the results are compared with more exact theories. Scaling laws for the effect of body size, shape and altitude on laminar wake electron production are given. Comparisons with boundary layer electron production rates are made for the case where peak wake and boundary layer enthalpies are equal and binary scaling is found to hold in the laminar wake. (Author)

AD-602 200 Div. 9
OTS Price $1.25

Army Natick Labs., Mass.
SOME EFFECTS OF JET-COMPRESSOR GEOMETRY ON EFFICIENCY: COMPRESSION-RATIO CURVES WITH TWO MAXIMA.
Technical rept.,
by Ronald A. Segars and Harold J. Hoge. Jun 64, 44p
Proj. 1A0 10501B010
ANL PR10

Unclassified report

Descriptors: (*Mixed-flow compressors, Geometric forms), (*Gas flow, Compressible flow), Jet mixing flow, Fluid flow, Compressive properties, Fluid dynamic properties, Supersonic flow, Momentum, Jet pumps, Effectiveness, Gases, Helium, Air, Refrigerants, Halocarbons.

Measurements were made with a new jet compressor of different geometry, and were compared with previous results. Efficiencies, compression ratios, and other data are presented for 5 systems of gases (He: Freon-113, He:CO2, air: Freon-12, air: air, and Freon-12: air). Calculations of momentum-flux balance within the mixing tube were made, and various results presented in a previous report are confirmed. Frictional losses in the mixing tube are shown for two different apparatuses, under several different operating conditions. The existence of two maxima in many of the curves of compression ratio versus outlet pressure is pointed out, and possible causes are discussed. A suggested cause of the second maximum is a rapid reduction shock loss in the driving stream, as the acceleration of this stream to a relatively high supersonic velocity is suppressed. (Author)

AD-602 201 Div. 9
OTS Price $1.25

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
LINEARIZED THEORY OF A TWO-DIMENSIONAL PLANING FLAT PLATE IN A CHANNEL OF FINITE DEPTH-1,
by D. K. Ai, A. J. Acosta, and Z. L. Harrison.
Apr 64, 50p E-110.2
Contract Nonr220 43

Unclassified report

Descriptors: (*Hydrofoils, Hydrodynamics), (*Hydrodynamics, Hydrofoils), (*Planing surfaces, Theory), Ship plates, Two-dimensional flow, Thickness, Lift, Cavitation, Gravity, Veloocity, Perturbation theory, Numerical analysis, Integrals, Geometry, Complex variables, Transformations (Mathematics).

Linearized free-streamline theory was used to calculate the spray-sheet thickness and lift-slope for a flat plate, cavitating, two-dimensional hydrofoil in a channel of finite depth with an upper free surface and lower boundary partly free and partly rigid. Only the case of zero cavitation number was considered. Some measurements were made of the submergence of a hydrofoil of four inches chord beneath the undisturbed free surface at velocities of 12 and 18 ft./sec. These agree with the trends of the theory but not with the magnitudes, the submergence always being greater than that predicted by the theory. (Author)

AD-602 217 Div. 9
OTS Price $1.25

Wigley (C.) London (England).
FURTHER INVESTIGATION OF THE EFFECT OF THE FLUID VISCOSITY ON WAVE RESISTANCE USING A MODIFICATION OF LAURENTIEFF'S METHOD,
by C. Wigley. May 64, 42p
Contract N62558 3642, Task 062 211

Unclassified report

Descriptors: (*Ship models, Fluid dynamic properties), (*Fluid flow, Fluid mechanics), Hydrodynamics, Water waves, Boundary layer, Parabolic bodies, Numerical analysis, Integrals, Mechanical properties, Great Britain.

AD-602 232 Div. 9
OTS Price $7.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
BLAST EFFECTS TESTS ON SIMPLE INSTRUMENTED SHELLS,
by Lawrence Rosendorf. Feb 64, 76p
PA TM1420

Unclassified report

Measurements were made of total radiant energy from flames for a series of pure hydrocarbons, varying widely in molecular structure and boiling point. The study was conducted using the Phillips Microburner, which simulates conditions for combustion existing in an aircraft gas turbine engine; i.e., a high intensity, turbulent-diffusion type, combustion process. The Microburner tests did not differentiate among hydrocarbons (including all of the normal- and isoparaffins, the mono- and bicycloparaffins, and the straight and branch chain olefins) having hydrogen contents above about 13 weight percent, heats of combustion above about 18,200, Luminometer Numbers above about 40, and ASTM Smoke Points above about 20 mm. At lower values, the total radiant energy increased rapidly with decrease in these properties. The hydrocarbons, other than those listed above, were rated in the following order of increasing flame radiation: the cycloolefins, tetracyclododecane, tetralin and the alkylbenzenes, benzene and styrene, and methylnaphthalene. The results also show that fuel volatility was not a significant factor under the test conditions. (Author)

AD-602 245 Div. 10, 25
OTS Price $5.60

Brown Univ., Providence, R. I.
MEASUREMENTS OF THE ATTENUATION OF SOUND BY SUSPENDED PARTICLES,
by R. A. Dobbins and S. Temkin.
Mar 64, 54p ABL/X115
Contract NOrd16640

Unclassified report

Research supported by the Allegany Ballistics Lab., Hercules Powder Co., Cumberland, Md.

Descriptors: (*Solid rocket propellants, Combustion), (*Sound, Attenuation), (*Aerosols, Fuel additives), Rocket propellants, Stability, Particles, Oleic acids, Particle size, Aerosol generators, Acoustic impedance.

The addition of metallic species to a propellant formulation frequently results in the suppression of combustion instability. The attenuation of acoustic waves by suspended particles is one stabilizing influence present when such a modification is made to the propellant composition. The work is an experimental study of the attenuation of acoustic waves by suspended particles with emphasis on dimensionless size range of greatest interest in the study of rocket instability. An aerosol composed of oleic acid particles of controlled size and concentration is produced in a La Mer generator. Attenuation of sound by the aerosol is measured by means of an acoustic impedance tube similar to those used to measure properites of acoustic insulating materials. Mean particle size and concentration are measured by transmission and sampling tests of the aerosol in situ. Results of measurements made to date indicate fair agreement with theory and show that the efficiency of the particles as acoustic attenuators decreases at small dimensionless sizes. The data confirm the existence of an optimum particle size to attenuate sound waves of a given frequency. (Author)

AD-602 259 Div. 10, 4, 20
OTS Price $0.75

Bureau of Mines, Washington, D. C.
A STUDY OF THE FEASIBILITY OF USING NUCLEAR EXPLOSIONS TO INCREASE PETROLEUM RECOVERY.
Rept. of investigations,
by Charles H. Atkinson and Robert T. Johansen. 1964, 28p
BM RI-6494

Unclassified report

Descriptors: (*Petroleum, Recovery), (*Nuclear explosions, Petroleum), Nuclear engineering, Production, Economics, Underground explosions, Feasibility studies.

Tremendous volumes of petroleum (crude oil and natural gas) at present cannot be recovered economically. The feasibility of using nuclear explosions for production stimulation therefore has been investigated. Data from underground nuclear tests were reviewed, and the physical effects were evaluated for stimulating petroleum production. Calculations of the effect on ultimate recovery of increasing reservoir temperature with nuclear explosives showed disappointingly small increases. Production increases caused by fracturing of massive low-permeability reservoirs appear technically and economically promising. Petroleum reservoirs that might be converted from submarginal to commercial production are being located and evaluated as to potential reserves and as a location for a field test. (Author)

AD-602 260 Div. 10, 4, 20
OTS Price $0.75

Bureau of Mines, Washington, D. C.
POTENTIAL OF NUCLEAR EXPLOSIVES FOR PRODUCING HYDROCARBONS FROM DEPOSITS OF OIL, NATURAL GAS, OIL SHALE, AND TAR SANDS IN THE UNITED STATES.
Information circular,
by J. Wade Watkins and C. C. Anderson. 1964, 22p
BM IC-8219

Unclassified report

Descriptors: (*Nuclear explosions, Petroleum), (*Hydrocarbons, Nuclear explosions), (*Petroleum, Recovery), Liquefied gases, Oils, Tar, Sand, Radioactivity, Deposits, Economics, Temperature, Underground explosions, Feasibility studies, Production.

The appreciable difference between producible proved reserves and ultimate reserves and resources of hydrocarbon deposits is of such magnitude that much petroleum, natural gas, shale oil, and bitumen will not be produced unless significant technological progress is made in production techniques. The shattering effect of contained nuclear explosives and, to a lesser extent, the heat produced, have been considered as stimulative forces when the thickness, depth, and nature of such deposits permit considering the use of nuclear devices. The technical feasibility of using nuclear explosives cannot be evaluated fully at present. Additional information is needed on the effects of pressure, heat, and radioactivity on the solids and fluids of hydrocarbon deposits, the nature and extent of induced fractures in different rock media, and the possibility of isolating and confining or removing radioactive contaminants. Final technical feasibility can only be determined by a field test. If technical feasibility is established, economic feasibility will depend upon the comparative cost of producing hydrocarbons by nuclear explosives and by conventional means. It is probable that an economic comparison would favor nuclear stimulation only where devices of relatively high yield could be used practicably and safely. (Author)

AD-602 274 Div. 10
OTS Price $1.00

General Applied Science Labs., Inc., Westbury, N. Y.
A SURVEY OF FUELS SUITABLE FOR EXTERNAL COMBUSTION APPLICATIONS,
by W. Chinitz. Jun 64, 34p GASL TM109
Contract DA30 069AMC216Z, ARPA Order 460

Unclassified report

Proj. Defender Research Study.

Descriptors: (*Fuels, External combustion engines), Alkynes, Boranes, Aluminum compounds, Borohydrides, Pyrophoric materials, Jet engine fuels, Aviation fuels, Hypersonic flight, Ignition, Feasibility studies, Chemical properties.

10. FUELS AND COMBUSTION

AD-601 772 Div. 10, 4, 14
OTS Price $1.75

National Cash Register Co., Dayton, Ohio.
A STUDY OF THE ENCAPSULATION OF HIGH ENERGY SUBSTANCES.
Final rept., 1 Apr 59-31 Dec 63.
by Constantine C. Petropoulos. Apr 64, 69p
Contract Nonr2848 00

Unclassified report

Descriptors: (*Liquid rocket propellants, Encapsulation), (*Encapsulation, Liquid rocket propellants), (*Plastics, Compatibility), Films, Permeability, Hydrazine, Polyamide plastics, Arcylic resins, Polymerization Copolymerization.

Initial work was directed towards the understanding of basic factors responsible for small molecules permeating polymeric films. Progress was made in this area. In addition, research was conducted in the area of encapsulation. This research included the study of basic mechanisms associated with encapsulation, compatibility of polymers with potential liquid fuels (e. g. hydrazine), synthesis of new polymers, and the encapsulation of liquid fuels or model compounds.

AD-601 984 Div. 10
OTS Price $2.75

Ashland Oil and Refining Co., Ky.
RECLAMATION OF JP-6 TYPE JET FUELS WHICH BECAME THERMALLY UNSTABLE DURING STORAGE.
Rept. for 15 Jun 63-15 May 64.
by Arnold M. Leas. Jun 64, 123p
Contract AF33 657 11097, Proj. 3048, Task 304801
APL TDR64 74

Unclassified report

Descriptors: (*Jet engine fuels, Purification), (*Fuel filters, Jet engine fuels), (*Fuel contamination, Jet engine fuels), Storage, Degradation, Biological contamination, Fuel additives, Stability, Thermal properties, Impurities, Processing, Fungus deterioration.

The thermal stability of nineteen degraded JP-6 type jet fuels was improved to a level in excess of the present MIL-J-25656B specification requirement by a filtration treatment. The improved thermal stability of these reclaimed fuels was retained for more than six months of ambient temperature storage. The ASTM-CRC Coker was used to measure thermal stability. The coker ratings could not be correlated quantitatively with the chemical and physical analyses because of the minute quantity of the contaminants. However, with the use of filter media these contaminants were concentrated sufficiently to show some degree of correlation with the coker ratings. Many of the additives present in these military fuels as well as those considered as possible future additives were moved in varying degress by reclamation filtration. The generation of static electricity, filter media life, process economics, and design variables were other parameters which were investigated. (Author)

AD-602 095 Div. 10
OTS Price $1.10

Factory Mutual Research Corp., Norwood, Mass.
HIGH SPEED FIRE DETECTION AND CONTROL OF FIRE IN SOLID PROPELLANT FUEL.
Progress rept. no. 7, Phase 2, 31 Jan-30 Apr 64.
4 May 64, 3p FMRC 15699
Contract NBy24974

Unclassified report

Descriptors: (*Solid rocket propellants, Fire safety), (*Fires, Solid rocket propellants), (*Exhaust gases, Combustion), Rocket propellant grains, Quenching (Inhibition), Solid rocket fuels, Water entry.

Work was based on the successful quenches of propellant fire at essentially atmospheric pressure. The test program involving 10 lb. hollow, cylindrical samples of A-3 propellant is nearly complete. Exhaust gas confinement by circular orifices during the firing of these sample grains both increased the burning pressure and reduced the available area of water entry. Success in extinguishing propellant fire at elevated burning pressures led to the active preparation of larger scale fire tests proposed for mid-1964 at the Naval Weapons Laboratory, Dahlgren, Virginia. (Author)

AD-602 152 Div. 10, 17
OTS Price $2.00

Phillips Petroleum Co., Bartlesville, Okla.
EFFECT OF JP-5 SULFUR CONTENT AND SEA WATER INGESTION ON HOT GAS CORROSION OF SUPER ALLOYS.
Progress rept. no. 3,
by R. M. Schirmer, H. T. Quigg, and R. A. Mengelkamp.
29 Jun 64 , 75p PPC 3686 64R
Contract NOw63 0406d

Unclassified report

Descriptors: (*Jet engine fuels, Corrosion), (*Gas turbines, Corrosion), Heat-resistant metals and alloys, Sulfur, Sea water, Gas turbine blades, Corrosion inhibition, Fuel additives, Thermal stresses, Tensile properties, Electroerosive machining, Petroleum, Failure (Mechanics), Structural properties, Sulfur compounds, Nickel alloys.

An experimental investigation was conducted to determine whether the maximum sulfur content of 0.4 weight per cent, currently allowed in grade JP-5 aviation turbine fuel, is a safe level for the protection of turbine blade alloys used in high-performance engines. Specimens of two nickel-base alloys (Inconel 713C and Sierra Metal 200) were exposed to vitiated air from the Phillips 2-inch combustor (56 air-fuel ratio) at high temperature (2,000 degrees Fahrenheit), high pressure (15 atmospheres), and high velocity (500 feet per second) during a five-hour cyclic test (55 minutes fuel-on and 5 minutes fuel-off). A statistically designed test program was used to evaluate the effect of three sulfur concentration levels in the fuel (0.0002, 0.040, and 0.40 weight per cent) at three sea salt concentration levels in the air (zero, 1.50, and 15.0 parts per million), and also any sulfur x sea salt interaction. The significance of test specimen metal losses and changes in tensile properties was established by analyses of variance, made at a confidence level of 95 per cent. (Author)

AD-602 153 Div. 10
OTS Price $2.00

Phillips Petroleum Co., Bartlesville, Okla.
MICRO BURNER STUDIES OF FLAME RADIATION AS RELATED TO HYDROCARBON STRUCTURE.
Progress rept. no. 4,
by R. M. Schirmer and E. W. Aldrich. May 64, 71p
PPC 3752 64R
Contract NOw63 0406d

Unclassified report

Descriptors: (*Aviation fuels, Combustion), (*Hydrocarbons, Combustion), Alkanes, Cycloalkanes, Alkenes, Aromatic compounds, Naphthalenes, Benzenes, Styrenes, Molecular structure, Gas turbines, Combustion chambers, Simulation, Flames, Brightness.

12. GUIDED MISSILES

AD-601 721 Div. 12, 27
OTS Price $1.75

Rocketdyne, Canoga Park, Calif.
PERFORMANCE DATA FOR INDIVIDUAL ATLAS MA-2 AND MA-5 ENGINES.
29 May 64, 70p Rocketdyne R5108 3, supersedes Rocketdyne R5108 2
Contract AF04 695 528

Unclassified report

Descriptors: (*Guided missiles (Surface to surface), Propulsion), (*Propulsion, Guided missiles (Surface to surface)), (*Rocket motors, Performance (Engineering)), Booster motors, Sustainer motors, Vernier rocket motors, Engineering, Data, Tables, Data processing systems, Computers, Guided missile trajectories, Optimization.

This report updates and supersedes Rocketdyne report R-5108-2, dated 28 February 1964, and presents specific performance data for individual MA-2 and MA-5 booster, sustainer, and vernier engines. These data can be used to optimize vehicle trajectories. (Author)

AD-601 737 Div. 12
OTS Price $0.50

Ordnance Aerophysics Lab., General Dynamics, Daingerfield, Tex.
A THIRD INVESTIGATION OF THE POLARIS A-3 RE-ENTRY SYSTEM SEPARATION SCHEME, IN THE BLOWDOWN FACILITY, FOR THE LOCKHEED MISSILES AND SPACE COMPANY, A DIVISION OF LOCKHEED AIRCRAFT CORPORATION.
Rept. for 1 Apr-18 July 63 and 15 Aug-18 Sep 63
by J. T. Jeter. 21 May 64, 4p, OAL 671 2
Contract NOw63 0405c

Unclassified report

Descriptors: (*Abstracts reentry vehicles), (*Reentry vehicles, Abstracts), Captive tests, Gas flow, Exhaust gases, Rocket motors (Solid propellant), Pressure, Aerodynamic loading, Second stage motors, Heat shields, Guide missile components, Perturbation theory, Guided missiles (surface-to-surface), Guided missiles (underwater-to-surface), Separation, Simulation.

This document contains the abstract only. The third investigation of the Polaris A-3 re-entry system separation scheme was conducted from 1 April through 18 July, and from 15 August through 18 September, 1963. The test runs were performed in the Blowdown Facility (Cell 6). This test was performed in two phases. The cold flow, or high pressure nitrogen phase of the test, was to determine the nature of the flow field which was produced by the buildup of rocket exhaust gases across the second stage heat shield and base region of the re-entry body flares. The parameters affecting non-repeatability of perturbing re-entry system forces were investigated, along with a statistical evaluation of their limits. The second phase, or hot flow phase of the test, was to determine pressure, forces, and moments on the re-entry bodies (with and without the re-entry body base diaphragms), and the various E-Bay heat shield and delta frame areas. Also investigated were variations of the perturbation velocities due to physical deviations from the basic configuration, and ignition delay of one or more of the re-entry body ejection motors.

AD-601 738 Div. 12, 8
OTS Price $0.50

Ordnance Aerophysics Lab., General Dynamics, Daingerfield, Tex.
TESTS OF THE HT/IT PIP TERRIER RADOMES IN THE BLOWDOWN FACILITY, FOR GENERAL DYNAMICS/POMONA.
by J. T. Jeter and F. T. Smith. 9 Jun 64, 3p OAL 663 1
Contract NOw 63 0405c

Unclassified report

Descriptors: (*Abstracts, Radomes), (*Radomes, Guided missiles (Surface-to-air)), Steel, Ceramic materials, Thermal stresses, Aerodynamic heating, Surfaces, Aerodynamic loading, Captive tests, Supersonic characteristics, Guided missile components.

Document includes abstract only. Tests of the HT/IT PIP Terrier radomes for the Pomona Division of General Dynamics Corporation were conducted at the Ordnance Aerophysics Laboratory in the Blowdown Facility (Cell 6) during the period of 27 January through 14 February 1964. All radomes tested were the pointed nose radome assemblies. None of the 1.35 radius rounded nose radome assemblies were tested. A total pressure/temperature rake plus three steel calibration radomes were used to establish test conditions. Ten ceramic-type radome assemblies were tested at either 100, 110, or approximately 125 percent thermal stress. Some of the assemblies were yawed to either 12 or 14 (1/2) degrees angle of attack during the run. Each model was tested in a Mach 2.44, free-jet airstream, at approximately sea level pressure conditions. Inner surface temperatures and loads were measured, and time histories were recorded. One steel calibration radome, and two ceramic type radome assemblies failed during the tests. Movies of all models were made throughout the tests. (Author)

AD-601 748 Div. 12
OTS Price $11.00

Office of Research Analyses, Holloman AFB, N. Mex.
SMALL PROBE VEHICLE STUDY PERFORMANCE SUMMARY, VOLUME I.
Dec 63, 150p
Proj. 7043
ORA 63 14

Unclassified report

Descriptors: (*Sounding rockets, Performance (Engineering)), (*Space probes, Specifications), *Ground support equipment, Specifications), Heat transfer, Payload, Design.

The report presents technical information on the first group of small probe vehicles considered under the study. It contains general information data, dimensions, weights, performances, comparison of computed performances with data advertised by manufacturers and performances observed in actual flights. Included are specifications for the ground support equipment required and notes on the payload compartment heat transfer conditions for each different vehicle. (Author)

AD-601 799 Div. 12, 9
OTS Price $2.60

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
USE OF LIFT FOR DECELERATION AND RANGE CONTROL FOR RE-ENTRY OF SPACE VEHICLES.
Arthur J. Schwaniger. 11 May 60, 29p
AMC-RA DA-TM39 60

Unclassified report

Descriptors: (*Spacecraft, Atmosphere entry), (*Atmosphere entry, Spacecraft), Lift, Deceleration, Velocity, Range (Distance), Control, Angle of attack, Descent trajectories.

A survey was made of large number of fuels in an effort to determine the most suitable for use in a specified external burning application. The original list of 27 fuels in five classes is reduced to nine acceptable fuels: JP-4, JP-5, acetylene, TEA, TMA, TEB, TBB, pentaborane and aluminum borohydride. The latter six of these fall into the class of pyrophoric fuels. Additional limitations tend to reduce this list still further. For example, under the flight conditions of interest, spontaneous ignition of JP-4, JP-5 and acetylene is marginal. At the lower condition of cone surface temperature (135F) the high spontaneous ignition temperature of TBB (190F) makes this fuel unacceptable. In addition, availability of pentaborane and aluminum borohydride is extremely restricted, and prices are very high. As a result, for most missions carried out in the specified ranges of flight conditions, the three pyrophoric fuels, TEA, TMA, and TEB appear to be the most satisfactory. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

No Entries

AD-602 026 Div. 12
OTS Price $1.00

Space Technology Labs., Redondo Beach, Calif.
AN ANALYSIS OF TRANSIENT PRESSURES DUE TO ROCKET SHUTDOWN IN A DUCTED UNDERGROUND LAUNCHER.
by C. N. Tsu. 30 Jun 64, 39p STL 6110 9487RU000
Contract AF04 694 1
BSD TDR64 92

Unclassified report

Descriptors: (*Silos, Exhaust gases), Exhaust systems, Design, Pressure, Volume, Failure (Mechanics), Captive tests, Equations, Tolerances (Mechanics), Guided missile launchers, Ducts, Guided missiles (Surface-to-surface), Rocket motors (Liquid propellant), Air Force.

A linearized analysis of the transient pressure phenomenon occurring in a ducted underground missile launcher of the Titan II type during the shutdown of rocket engines is presented. Such a shutdown may take place during a captive test or an aborted launch. Comparisons of the analysis and test data are made, and the usefulness of the present analysis for predicting the shutdown transient pressures is demonstrated. (Author)

AD-602 055 Div. 12, 15
OTS Price $0.75

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ZONAL HARMONIC PERTURBATIONS OF AN ARTIFICIAL SATELLITE.
by Boris Garfinkel and Gregory T. McAllister. May 64, 22p
Proj. 1A010501B010
BRL 1246

Unclassified report

Descriptors: (*Satellites (Artificial), Orbital trajectories), (*Orbital trajectories, Harmonic analysis), Potential theory, Geophysics, Equations, Motion, Hamiltonian, Transformations (Mathematics), Polynomials, Fourier analysis, Calculus of variations, Perturbation theory.

This paper extends the known solution of the main problem of the artificial satellite theory to include the effects of all the higher zonal harmonics of the geopotential. The method of von Zeipel is used to calculate the secular and the long-periodic variations of orders J sub m and J sub m/J sub 2 respectively. The results are exhibited in a compact form, in terms of the associated Legendre polynomials in (1 - e to the 2nd power) to the minus 1/2 power and in cos i. (Author)

AD-602 064 Div. 12, 15, 30
OTS Price $14.50

Space Technology Labs., Inc., Redondo Beach, Calif.
ESPOD OPERATING INSTRUCTIONS AND CARD FORMATS.
24 Jun 64, 211p STL 8497 6066RU000
Contract AF19 628 594, Proj. ES3 496L3627
ESD TDR64 394

Unclassified report

Descriptors: (*Programming (Computers), Handbooks), (*Handbooks, Programming (Computers)), (*Orbital trajectories, Programming (Computers)), Input-output devices, Punched cards, Magnetic tape, Systems engineering, Operation.

This report contains operating instructions and other aids pertinent to the ESPOD program. The sections are arranged in the order that they will be used to set up and run the ESPOD program. They are: (a) Input control card descriptions and deck setup; (b) Operational instructions; (c) Output descriptions; and (d) Program constants. (Author)

AD-602 108 Div. 12, 15, 30
OTS Price $3.60

Space Technology Labs., Inc., Redondo Beach, Calif.
ESPOD FUNCTIONAL DESCRIPTION.
24 Jun 64, 35p STL 8497 6067RU000
Contract AF19 628 594, Proj. ES3 496L3627
ESD TDR64 393

Unclassified report

Descriptors: (*Programming (Computers), Orbital trajectories), Orbital trajectories, Programming (Computers)), Trajectories, Satellites (Artificial), Lunar probes, Interplanetary trajectories, Ballistics, Geophysics, Drag, Corrections, S-matrix, Simulation, Mathematical models.

ESPOD is a general orbit determination program prepared for use by the SPACETRACK/SPADATS Center, Ent Air Force Base, Colorado Springs, Colorado. Its primary purpose is to determine satellite orbits. It determines the elements of a satellite orbit and a covariance matrix of uncertainty in the determination, starting from some initial estimate of these elements and correcting it in accordance with observational data. It predicts the future position and velocity of the satellite from the best elements obtained. The program includes a unique collection of mathematical, statistical, and operational techniques to make it operate rapidly and automatically and to produce high precision in the results. (Author)

AD-602 214 Div. 12
OTS Price $8.10

Aerospace Corp., Los Angeles, Calif.
THE EFFECT OF GEOPHYSICAL AND GEODETIC UNCERTAINTIES AT LAUNCH AREA ON BALLISTIC MISSILE IMPACT ACCURACY,
by R. C. Gore. 15 May 64, 90pTDR-269 4922 2, Reissue A
Contract AF04 695 269
BSD TDR63 256 Reissue A

Unclassified report

This rept. replaces and supersedes TDR-269(4922)-2 dated 22 Jan 64.

Descriptors: (*Launch sites, Geophysics), (*Terminal ballistics, Errors), Guided missile ranges, Geodesics, Launching, Guided missile trajectories, Circular error probable, Velocity, Inertial guidance, Radio homing, Ballistics, Numerical analysis.

The effects of uncertainties in the geophysical and geodetic parameters related to the establishment of ballistic missile launch sites on the impact accuracy of the ballistic missile were derived analytically. Curves of the derived impact miss coefficients are presented for radio- inertially-guided missiles for ranges of 500 to 21,000 nautical miles and burnout angles of 5 to 90 degrees from the vertical. (Author)

AD-602 220 Div. 12, 15, 30
OTS Price $6.60

Brown Engineering Co., Inc., Huntsville, Ala.
A FORTRAN PROGRAM TO CALCULATE A SURFACE-TO-AIR MISSILE TRAJECTORY.
Technical note,
by C. F. Ostner, W. B. Warren and H. S. Dupree. May 64, 66p BrownEng R104
Contract DA01 009ORD1068

Unclassified report

Descriptors: (*Programming (Computers), Guided missile trajectories), (*Guided missile trajectories, Programming (Computers)), (*Guided missiles (Surface-to-air), Trajectories), Programming languages, Geophysics, Aerodynamics, Ballistics.

This memorandum presents the results to date of a study of the problem of re-entry into the earth's atmosphere, by a vehicle returning from a space flight mission. Various re-entry conditions are studied using aerodynamic lift for deceleration and range control. Particular attention is given to cases where re-entry velocity is equal to escape velocity. The report shows that for non-lifting trajectories with re-entry velocity of 11,000 m/s (approximately escape velocity) only 0.4 degree variation in re-entry path angle is allowable if peak deceleration is to be held less than 10 g's. Range from re-entry to impact is shown to be variable up to 10,000 km for re-entry with escape velocity. (Author)

AD-601 809 Div. 12, 13
OTS Price $1.00

Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
NOISE SURVEY OF AUXILIARY SUPPORT EQUIPMENT AT ONE ATLAS COMPLEX AND ONE TITAN I COMPLEX, CAPE KENNEDY MISSILE TEST ANNEX, ATLANTIC MISSILE RANGE.
Rept. for 8 Nov 61-31 Aug 62
by Robert T. England. Apr 64, 34p
Proj. 7231, Task 723104
AMRL TDR64 31

Unclassified report

Descriptors: (*Noise, Ground support equipment), (*Ground support equipment, Launching sites), Guided missiles, Sound pitch, Narrowband, Measurement, Hearing, Speech, Safety, Instrumentation, Experimental date, Blowers, Hydraulic systems, Compressors, Rectifiers, Pneumatic devices, Air conditioning equipment, Deafness.

Noise level measurements were made on several items of ground support equipment at an Atlas complex and Titan I complex. Overall (from 18.7 to 9600 cps) and octave-band (9 octaves within the overall range) sound pressure levels measured in the near vicinity of the equipment are presented. One-third octave-band sound pressure levels are also given for certain equipment which generates narrow-band sound levels. Exposure time limitations and speech interference levels for individuals working in the vicinity of the equipment are discussed. Recommendations are made for measures to be taken to insure against hearing loss and to improve the areas for speech effectiveness. (Author)

AD-601 899 Div. 12, 27, 32
OTS Price $0.50

RAND Corp., Santa Monica, Calif.
ADVANCED SYSTEMS TESTING ON A MANNED ORBITAL SPACE STATION.
by D. L. Trapp. Jun 64, 18p P-2911

Unclassified report

Descriptors: (*Manned spacecraft, Flight testing), (*Electric propulsion, Flight testing), (*Space flight, Costs), Space stations, Satellites (Artificial), Manned, Tests, Malfunctions, Logistics, Test equipment.

Consideration is given to the cost of space-station testing and procedures for estimating these costs with direct reference to testing an electrical propulsion system. The advantages of manned-space-station tests,as compared with conventional flight tests, are pointed out.

AD-601 951 Div. 12, 14, 25
OTS Price $0.50

Army Materials Research Agency, Watertown, Mass.
BUCKLING OF TORISPHERICAL SHELLS UNDER INTERNAL PRESSURE,
by Jiro Adachi and Miloslav Benicek. Mar 64, 20p
Proj. 1A010501B010
AMRA TR64 10

Unclassified report

Rept. on Basic Research in Physical Sciences.

Descriptors: (*Guided missile components, Bulkheads), (*Structural shells, Buckling (Mechanics)), (*Bulkheads, Buckling (Mechanics)), (*Polyvinyl chloride, Physical properties), Pressure vessels, Model tests, Geometric forms, Thickness, Elasticity, Stresses.

Buckling experiments were performed on a series of model torispherical bulkheads loaded by internal fluid pressure. Models were rigid polyvinyl-chloride with a base diameter of 10.5 inches. Parameters examined included thickness, central angle, and toroidal radius. Initial data obtained shows the critical buckling pressure to vary exponentially with thickness and almost linearly with central angle. The buckling pressure was also found to be very sensitive to change in toroidal radius. The use of rigid polyvinyl-chloride as a model material permitted economical fabrication of test bulkheads with very uniform thickness and uniform material properties throughout. (Author)

AD-601 962 Div. 12, 2, 9
OTS Price $0.75

Aerospace Corp., Los Angeles, Calif.
DYNAMIC ATMOSPHERIC EFFECTS UPON SATELLITE MOTION AND SATELLITE LIFETIME.
by R. W. Bruce. 15 May 64, 36p TDR-269 4550 10 8
Contract AF04 695 269
SSD TDR64 51

Unclassified report

This rept. was submitted to the COSPAR Working Group I, Tracking, Telemetry, and Dynamics, International Space Science Symposium (5th), May 12-16, 1964, Florence, Italy.

Descriptors: (*Satellites (Artificial), Life expectancy), Orbital trajectories, Atmosphere models, Dynamics, Solar radiation, Diurnal variations, Solar wind, Magnetic storms, Geophysics, Mathematical prediction, Data, Graphics.

Various model atmospheres are examined with regard to their effect upon the prediction of (1) satellite lifetime and (2) satellite orbit ephemerides. High speed computer results based upon the empirical dynamic model atmospheres of Paetzold and Jacchia are compared to corresponding results based on the ARDC 1959 static model atmosphere that has been in wide use in the United States. For the sake of completeness the atmospheric density profiles and dynamic models of Nicolet, King-Hele, Harris, and Priester are described together with static models such as CIRA 1961 and the U. S. Standard Atmosphere,. 1962. It is shown for near-earth altitude regions that predicted values of satellite lifetime may differ by a factor of 30 depending upon whether use is made of a static or a dynamic model atmosphere. This is primarily due to the fact that the large long-term influence of the 11-year solar cycle can introduce appreciable differences between static models, which are patterned after a given time period, and dynamic models, which vary with time. In the case of satellite ephemeris prediction, short-term effects such as those due to geomagnetic disturbances which are not accountable with static models become important as well. It is shown that the predicted in-track position of a typical satellite may be in error by approximately 10 kilometers (5 nautical miles) after a 12-hour time period if an intense but unpredictable magnetic storm occurs in that interval. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-601 782 Div. 13, 11
OTS Price $5.60

RAND Corp., Santa Monica, Calif.
URBAN UNDERGROUND HIGHWAYS AND PARKING FACILITIES.
by George A. Hoffman. Aug 63, 54p RM 3680 RC
Unclassified report

Descriptors: (*Roads, Underground structures), (*Underground structures, Costs), Traffic, Passenger vehicles, Urban areas, Design, Construction, Operation.

The cost of constructing and operating selected conventional urban highways and their right-of-way cost are plotted over a half-century span. Similarly, the costs of some automobile vehicular tunnels built in this century are also presented for comparison. The operating costs of highways and tunnels are also listed and compared, and those for underground roads are shown to be lower already than those for equal-capacity surface roads. Having deduced from a simple cost comparison that underground urban automotive traffic might not involve much greater costs than surface traffic in the future, the design of future urban highways and parking is investigated, and secondary features and advantages of such systems are enumerated. The conclusions, suggestions, and implications of the study are then discussed.

AD-601 883 Div. 13, 14, 33
OTS Price $2.50

Ohio River Div. Labs., Engineer Corps, Cincinnati.
REPETITIVE LOADING MODEL TESTS OF PRESTRESSED RIGID PAVEMENT ON A LOW STRENGTH SUBGRADE,
by P. F. Carlton and Ruth M. Behrmann. May 64, 114p
ORDL-EC TR4 28
Unclassified report

Report on Engineering Investigations for Rigid Pavements.

Descriptors: (*Concrete, Landing fields), (*Landing fields, Model tests), Instrumentation, Test equipment, Failure (Mechanics), Pavements, Runways, Deflection, Strain (Mechanics), Loading (Mechanics), Reinforced concrete, Cements.

This report presents the results of a laboratory model study to observe the behavior of prestressed concrete slabs supported on a low-strength subgrade and tested to complete failure by repetitive loading. The purpose of the study was to develop relationships between magnitude of load, number of load applications, and pavement physical properties. Included in this report is a description of the design of the model, physical properties of the materials comprising the model, test procedures and instrumentation used with the model. The test results are presented with an analysis and discussion. (Author)

AD-601 894 Div. 13
OTS Price $3.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
LATERAL THRUST ON PILES.
Technical rept.,
by L. W. Heller. 15 Jun 64, 232p
Proj. Y F015 15 01 006
NCEL R283
Unclassified report

Descriptors: (*Foundations (Structures), Loading (Mechanics), Thrust, Soils, Sand, Clay, Pressure, Tests, Soil mechanics, Elasticity, Theory, Strain (Mechanics).

An investigation was made to obtain the in-place properties of deep soil deposits with relation to pile foundations subjected to lateral thrust which would result in the verification of the Palmer-Thompson Theory for piles subjected to lateral load. Lateral-load tests were conducted on 16-inch-wide piles in a sand fill and a natural clay deposit. Incremental, repetitive and sustained free-head and fixed-head loadings were applied to a single pile instrumented with soil-pressure and pile-deflection gages. Laboratory soil tests were conducted on samples from the pile test sites. The experimental results indicate that the pile-soil system does not respond elastically to a lateral load. Since the Palmer-Thompson Theory is premised on elastic pile-soil behavior, verification of this theory has not been achieved. (Author)

AD-601 897 Div. 13
OTS Price $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
INVESTIGATION OF NEW CONCEPTS FOR COLLECTIVE PROTECTION.
Technical note.
by N. Oldson and W. Nehlsen. 1 Jun 64, 12p
Proj. Y F011 08 03 326
NCEL N597
Unclassified report

Descriptors: (*Filters (Fluid), Air), Contamination, Costs, Charcoal, Paper, Feasibility studies, Sorption.

The feasibility of various filtration and sorbtion processes for use in collective protectors is studied with a view to reducing the overall cost of collective protection. Reports on electrostatic precipitation, venturi scrubbers, catalytic oxidation, fluidized beds, and other techniques are reviewed. It is concluded that pleated paper and charcoal filters still offer the most advantages in simplicity, reliability, durability, and cost, and that no new techniques or materials offer an improvement in overall effectiveness. Redesign of the present collective protectors should permit a useful weight and size reduction, and possibly a slight cost reduction. However, it does not appear to be possible within the present state of art to build a collective protector for $0.25 per cfm capacity.

AD-601 948 Div. 13
OTS Price $0.75

Naval Civil Engineering Lab., Port Hueneme, Calif.
PIONEER POLAR STRUCTURES, PORTABLE MAINTENANCE SHELTER.
Technical rept.
by G. E. Sherwood. 22 Jun 64, 21p
Proj. Y F015 11 01 143
NCEL R317
Unclassified report

Descriptors: (*Shelters, Portable), (*Polar regions, Shelters), (*Maintenance vehicles, Towed vehicles), Sleds, Structural parts, Paulins, Aluminum, Packaging, Environmental tests.

The need for adequate shelter for maintenance and repair of construction and other equipment in pioneer polar camps resulted in the development of a packaged maintenance shelter. The shelter is a canvas-covered, aluminum-frame structure. It is skid-mounted for easy portability around a work area. The 20- by 24-foot shelter is adequate for the repair and maintenance of equipment as large as a Size 2 snow tractor and a Size 4 standard tractor. A standard NCEL portable wanigan was outfitted with shop equipment and tools as a companion piece for the shelter. A prototype shelter was evaluated on the Ross Ice Shelf in Antarctica. It was concluded from the test that the shelter and its outfitting is well suited for the maintenance and repair of equipment at pioneer polar camps and that it should be included as a facility for such camps. (Author)

This program computes a trajectory from launch or any point thereafter to any other time or to impact. Point masses and a nonrotating oblate spheroid earth are assumed. The program is written in FORTRAN IV and is used on the IBM 7040 computer. It will accommodate a one, two, or three stage vehicle. (Author)

AD-602 278 Div. 12, 26
OTS Price $1.00

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
PRODUCTION ENGINEERING OF METAL PARTS FOR LITTLE JOHN ROCKET MOTOR XM26E3 WITH FIN AND FIN BARREL ASSEMBLY,
by Wilford C. Montross. May 64, 38p
PA TR3168

Unclassified report

Descriptors: (*Rocket components, Rocket motors), (*Rocket motors, Production), (*Fins, Production), Rocket motor nozzles, Structural shells, Costs, Reliability, Metals, Welds, Suppressors.

Several components on the production engineered XM26E3 rocket motor provided a reduction in cost over the corresponding components of the XM26E1 rocket motor through savings in tooling, labor and materials costs. Cost savings for the production engineered shell assembly were not significant; however, reliability was increased by the elimination of welds. The production engineered one-piece nozzle eliminated close tolerances required at the mating surfaces between the nozzle and nozzle tip of the two-piece assembly and will eliminate a cause for possible rejects through misalignment of parts. The production engineered fins showed an increase in cost over the original fins; however, they have an advantage in that external disassembly and replacement of fins was made possible. (Author)

AD-602 287 Div. 12, 22
OTS Price $1.00

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
ENVIRONMENTAL TESTING OF SQUIBS,
by Philip H. Garrard. 27 May 64, 36p
Proj. 1B242403D231
AMC-RA RT-TR-64 7

Unclassified report

Descriptors: (*Explosives initiators, Environmental tests), Guided missiles (Surface-to-surface), Reliability, Safety, Failure (Mechanics), Temperature, Shock (Mechanics), Vibration, Autoignition, Explosive actuators, Guided missile components.

The results of environmental testing of 135 piston actuator, dimple actuator, and match type squibs are presented. Tests conducted were: high and low temperature, drop, shock, vibration, altitude, no-fire, humidity, auto-ignition, and temperature shock. Two failures occurred during the program: the first was the breakage of a lead wire under vibration, and the second was the failure of a closure at firing. (Author)

14. MATERIALS (NON-METALLIC)

AD-601 697 Div. 14, 10, 17
OTS Price $1.60

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
THE FIELD EVALUATION OF AN EXPERIMENTAL AIR DRY FUEL RESISTANT COATING.
Interim rept. no. 1,
by Virgil O. Hatch. 6 Mar 64, 18p
Proj. 1H0 24401A110 05
CCL 160; AD 600 030

Unclassified report

Descriptors: (*Plastic coatings, Environmental tests), (*Acrylonitrile polymers, Plastic coatings), (*Butadienes, Polymers), (*Fuel tanks, Corrosion inhibition), Coatings, Phenolic plastics, Elastomers, Fuel trucks.

AD-601 698 Div. 14, 2, 20
OTS Price $1.25

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
INVESTIGATION OF THE FEASIBILITY OF MANUFACTURING AGGREGATE BY NUCLEAR METHODS.
Rept. for Apr-Jun 63,
by R. L. Curry. Apr 64, 41p
Proj. 4A022601A880
AEWES MP6 643

Unclassified report

Descriptors: (*Basalt, Cratering), (*Nuclear explosions, Explosion effects), Rock (Geology), Material forming, Feasibility studies, Particle size, Radioactivity, Decay schemes.

The report covers a limited study of preshot and postshot characteristics of basalt in the area of the Danny Boy nuclear event, to determine if it would be practical to manufacture aggregate for construction purposes by nuclear means. In this event approximately 20 percent of the ejecta could have been made available for use as concrete aggregate by seieving. Secondary crushing would have produced a greater quantity. Other studies would be necessary to determine the effect of nuclear blasts upon other types of rock. (Author)

AD-601 729 Div. 14, 4, 16
OTS Price $2.60

Max-Planck-Institut für Zellchemie, Munchen (West Germany).
THE BIOSYNTHESIS OF RUBBER.
Final technical rept.
by J. Berndt. 30 Nov 63, 23p
Grant AF EOAR63 35
AFOSR 64 1136

Unclassified report

Descriptors: (*Rubber, Biosynthesis), Biochemistry, Particles, Enzymes, Polymerization, Magnesium, Radioactivity, Radiation effects, Inhibition, Isomerases, Isoprene, Molecular structure, Purification, Storage, Synthesis (Chemistry), Phosphates, Chemical reactions, Toxicity.

Isopentenyl pyrophosphate is incorporated into rubber by latex (from Hevea brasiliensis) in the presence of Mg ions. By removal of the isopentenylpyrophosphate isomerase from latex it was shown, that dimethylallyl pyrophosphate is necessary as a primer for the rubber biosynthesis. Hence, the formation of the rubber molecule is a de novo synthesis. The polymerase is Mg dependent and is inhibited by SH-poisons, as could be shown with latex freed from isopentenyl-pyrophosphate isomerase. (Author)

AD-601 753 Div. 14
OTS Price $1.00

National Carbon Co., Lawrenceburg, Tenn.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOLUME XIII. DEVELOPMENT OF A FINE-GRAIN ISOTROPIC GRAPHITE FOR STRUCTURAL AND SUBSTRATE APPLICATIONS.
Rept. for May 60-Sep 62
by R. A. Howard and E. L. Piper. May 64, 36p
Contract AF33 616 6915, Projs. 7350, 7381, Tasks 735002, 738102
WADD TR61 72V13

Unclassified report

Descriptors: (*Graphite, Production), Structural properties, Mechanical properties, Thermal expansion, Thermal properties, Silicon coatings, Ceramic coatings, Carbides, Antioxidants, Heat treatment, Structural parts, Isotropism, Carbon, Fracture (Mechanics), Asphalt, Aging (Materials), Processing, Production, Refractory materials, Silicon compounds.

The report describes the development, fabrication, and physical properties of grade RVC graphite (formerly designated as experimental grade RT-0029). Grade RVC was manufactured in sizes up to 18 inches in diameter by 15 inches in length and is nominally characterized by a bulk density of 1.81 g/cc, an admittance to N sub 2 of .02 and .006 sq. cm. sec. w. g. and a. g. respectively, and a room temperature flexural strength w.g. and a.g. of 2560 and 1930 lbs sq. in. respectively. RVC is an excellent substrate material for silicon carbide coatings because its thermal expansion between 400 and 1000C is approximately 0.3 per cent in both grain directions. This expansion is in the same range as that for silicon carbide. Results are also presented on high temperature oxidation of silicon carbide coated grade RVC specimens. The unusually good oxidation protection afforded the graphite by the coating demonstrates the marked superiority of this substrate over other graphite materials which do not match the silicon carbide in thermal expansion. (Author)

AD-601 754 Div. 14
OTS Price $1.50

National Carbon Co., Lawrenceburg, Tenn.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOL. XXXII. STUDIES OF BINDER SYSTEMS FOR GRAPHITE.
Rept. no. 32 for Sep 61-Dec 62,
by T. Edstrom, I. C. Lewis, R. L. Racicot, and C. F. Stout.
May 64, 53p
Contract AF33 616 6915, Projs. 7350, 7381, Tasks 735002, 738102
WADD TR61 72 V12

Unclassified report

Descriptors: (*Binders, Graphite), (*Graphite, Binders), Aging (Materials), Thermosetting plastics, Pitch (Material), Furan plastics, Naphthalenes, Thermal properties, Physical properties, Chemical properties, Furfuryl alcohols, Oxidizers, Oxides, Sulfates, Ammonium compounds, Chlorates, Sulfur, Thermoplastics, Pyrolysis, Experimental data.

Binder systems were investigated with respect to their thermosetting characteristics both to replace pitch-sulfur combinations presently used in the pressure-curing process and to provide binders for development of new graphite grades. The binder systems included: (a) prepolymerized furfural-alcohol resin; (b) pitch, furfural, furfuryl-alcohol combinations; (c) pitch with a ferric chloride catalyst; and (d) pitch with oxidizers such as inorganic persulfates, chlorates and oxides. Acenaphthylene pitch, a new binder, was investigated with regard to thermosetting properties when used in the pressure-curing process. These binder systems were used in the fabrication of graphite articles and property determinations were made on the finished graphites.

Division 13 - INSTALLATIONS AND CONSTRUCTION

AD-602 045 Div. 13, 14
OTS Price $9.10

Massachusetts Inst. of Tech., Cambridge. School of Engineering.
NONLINEAR DYNAMIC RESPONSE OF REINFORCED CONCRETE CIRCULAR ARCHES.
by Indravadan K. Shah. Jan 64, 108p MIT DE R64 6, DSR-9383
Contract NBy32227

Unclassified report

Descriptors: (*Reinforced concrete, Load distribution), (*Structures, Reinforced concrete), Structural parts, Concrete, Failure (Mechanics), Dynamics, Loading (mechanics), Steel, Differential equations, Difference equations, Programming (Computers), Mechanical properties, Numerical methods and procedures, Strain (Mechanics), Elasticity, Geometry, Deformation.

A method is developed for predicting the response and the ultimate load carrying capacity of reinforced concrete circular arches under dynamic loading. The arch may be hinged or clamped at the ends. A set of differential equations and boundary conditions governing the behavior of reinforced concrete arches under dynamic loading is formulated. These equations are derived by considering the arch element in its deformed state. The force-strain relations are formulated by assuming a nonlinear stress strain curve for concrete and a bilinear stress strain curve for steel. The governing differential equations are converted into difference equations which, together with the force-strain relations, are solved by a step by step method of numerical integration. A program for the IBM 7094 computer is prepared to handle extensive computations involved. The influence of a few parameters on the response and the load carrying capacity of a particular arch is studied. (Author)

AD-602 059 Div. 13, 25
OTS Price $0.75

Redstone Scientific Information Center, Redstone Arsenal, Ala.
PHOTOELASTICITY: APPLICATIONS AND METHODS.
by G. Delanghe. 9 Jun 64, 27p
RSIC 191; TT 64 11814

Unclassified repor

Trans. of le Genie Civil (France) 1927, v. 91, p. 243-249.

Descriptors: (*Photoelasticity, Test methods), (*Load distribution, Measurement), Mathematical analysis, Structures, Stresses, Bridges, Beams (Structural), Foundations (Structures) Geometric forms; Fracture (Mechanics), Models (Simulations), Model tests.

AD-602 070 Div. 13, 2
OTS Price $2.00

RAND Corp., Santa Monica, Calif.
TITLES AND ABSTRACTS GEOLOGIE UND BAUWESEN (GEOLOGY AND CIVIL ENGINEERING) 1946 TO 1962.
by Klaus W. John. Jun 64, 73p P-2934

Unclassified report

Descriptors: (*Engineering geology, Abstracts), (*Bibliographies, Engineering geology), Geology, Civil engineering, Hydrology, Rock (Geology), Mechanics, Underground structures, Dams, Anchors (Structural), Soil mechanics, Geophysics, Reviews.

All entries, titles, and titles and abstracts are listed under one of the following subject groups: Engineering geology, geohydrology and hydrology, engineering mechanics, rock mechanics, testing and test results, tunnels and underground excavations, dam and rock abutments, slopes and landslides, rock bolting and rock anchors, soil mechanics, geophysics, and miscellaneous titles. Within the subject headings (numbers), titles and abstracts are listed in chronological sequence. The resulting index numbers are used in the authors' index.

AD-602 263 Div. 13, 1, 17, 26
OTS Price $2.25

Airesearch Mfg. Co., Los Angeles, Calif.
DESIGN AND MANUFACTURING DEVELOPMENT OF LIGHTWEIGHT HEAT EXCHANGERS.
Interim technical progress rept., Phase 2, 1 Oct 63-29 Feb 64,
by K. O. Parker, C. M. Lee, D. McGrath, W. Brown, and E. L. Powell. Feb 64, 92p Airesearch L9402
Contract AF33 657 9340, Proj. 7 936
ASD TR7 936 V6

Unclassified report

Descriptors: (*Heat exchangers, Manufacturing methods), Design, Niobium alloys, Zirconium alloys, Palladium alloys, Oxygen, Aluminum alloys, Nickel alloys, Gold alloys, Tests, High temperature research, Aging (Materials), Acrylic resins, Plastic seals, Aerospace craft, Cryogenics, Joints, Brazing, Stresses.

The final assembly operations for completion of the Cb-1%-Zr, Hastelloy X, and 6061-T6 aluminum test modules were described. The tests performed were described and preliminary test results were listed. Final assembly operations of the Cb-1%-Zr core disclosed lack of ductility due to excess oxygen in the metal and internal surface inperfections in the tubing that required modifications in forming operations on the tubes at the upper header. Welding operations of the lap joint between the lower and upper headers of the core disclosed the need for extraordinary controls in fit and restraint to achieve satisfactory welds. The tendency of AGCI braze alloy (50% Au, 25% Ni, 25% Pd) to alloy with Hastelloy X, although less than with stainless steel, dictated a maximum of a single repair cycle using a lower melting temperature alloy. Preplaced braze alloy rings, held in place with a volatile acrylic resin, provided leak-tight tube-header joints in more than 99.5 percent of those attempted on the core. During final assembly operations of the aluminum core, it was learned that accelerated aging, which reduced the ductility of the tubing, made it necessary to modify the shape of the ends of the tubes to prevent splitting. The epoxy sealing material for the tube-header joints proved to be partially effective at liquid hydrogen temperature and at temperatures of 300F to 350F. (Author)

Descriptors: (*Pyrolytic graphite, Pyrolysis), (*Graphite, Vapor plating), Physical properties, Mechanical properties, Thermal expansion, Pressure, Temperature, Hydrogen, Helium, Argon, Chlorine, Hydrocarbons, Anisotropy, Feasibility studies, Velocity, Methane, Heat treatment, Organic coatings, Carbons, Textiles.

Work on pyrolytic or vapor-deposited graphite under this program was limited to mechanism studies and property measurements. Methods of depositing high quality pyrolytic graphite are described with evidence as to the cause of conical growths and delaminations within the structure of the material. Results are presented on the use of hydrogen, helium and argon as diluents, and on the use of chlorine as an additive in the pyrolytic process. The mean deposition rate is shown to be a function of hydrocarbon concentration, diluent type, gas velocity, temperature and pressure. Theoretical studies of the equilibrium composition of methane as affected by changes in temperature and pressure are presented. Feasibility studies on the production of graphite of carbon vapor deposition were conducted which indicate that non-lamellar graphite with a predetermined degree of anisotropy can be produced by this method. Room temperature pull strength yarn has been increased as much as 300 per cent by reinforcement of the yarn with thin coatings of pyrolytic carbon; both single and multiple strand yarns have been coated. (Author)

AD-601 845 Div. 14, 25
OTS Price $2.25

Redstone Scientific Information Center,
Redstone Arsenal, Ala.
MATERIALS UTILIZABLE IN OPTICAL SYSTEMS WORKING IN THE INFRARED,
by P. Billard. 19 Jun 64, .94p
RSIC 193; TT 64 11809

Unclassified report

Trans. of Acta Electronic (France) 1962, v. 6, no. 1, p. 7-66.

Descriptors: (*Infrared optical materials, Physical properties), Infrared optical systems, Materials, Glass, Cystals, Optical properties, Refraction, Mechanical properties, Thermal properties, Material forming, Tables, France.

After reviewing the materials, grouped into families, which may serve in infrared optical systems, and recalling a few concepts of crystal physics, a discussion is given of the most important optical properties whose knowledge enables one to make a judicious choice among all materials. A classification is set up based solely on the refractivity and dispersion of the materials and each is assigned a symbol consisting of letters, permitting one to condense their main characteristics. Attention is called to the thermal and mechanical properties which may influence the performance of the optical systems, or determine the technology of and working of the materials. (Author)

AD-601 851 Div. 14, 4
OTS Price $0.50

Frick Chemical Lab., Princeton Univ., N. J.
CLEAVAGE REACTIONS IN CROSSLINKED URETHANE ELASTOMERS.
ONR technical rept.,
by A. V. Tobolsky, V. Johnson, and W. J. MacKnight.
Jun 64, 17p RLT-82
Contract Nonr1858 07, Proj. NR356 377

Unclassified report

Descriptors: (*Elastomers, Isocyanate plastics), (*Isocyanate plastics, Chemical bonds), Polymers, Rupture, Chemical reactions, Decomposition, Stresses, Relaxation time.

A study of network cleavage in a crosslinked polyurethane elastomer was made using the technique of stress relaxation. It was found that the data could be well represented by a sum of two exponential decay terms, and a theoretical explanation for this is presented. Stress relaxation in the polyurethane sample investigated is discussed in terms of the reversible cleavage of various linkages formed by isocyanate reactions. It is possible to identify two different decay processes and obtain activation energies for these processes. These are identified with cleavage of two different linkages. It is not possible at present to give a certain chemical identification of the linkages responsible for stress decay. (Author)

AD-601 852 Div. 14, 4
OTS Price $0.75

Frick Chemical Lab., Princeton Univ., N. J.
VISCOELASTIC PROPERTIES OF MONODISPERSE POLYSTYRENE.
ONR technical rept.
by A. V. Tobolsky, J. J. Aklonis, and G. Akovali. Jun 64, 27p RLT-81
Contract Nonr1858 07, Proj. NR356 377

Unclassified report

Descriptors: (*Styrene plastics, Viscoelasticity), Polymers, Theory, Molecular weight, Relaxation time, Tensile properties, Shear stresses, Friction.

The viscoelastic properties of five monodisperse polymer samples of polystyrene ranging in molecular weight between 80,000 and 270,000 were studied and accurate values of Eta sub t, J sub e, tau sub m, and E sub m were obtained. It is shown that the dependence on molecular weight of these quantities is very different from that predicted by the Rouse-Bueche Theory or by the Ferry Landel Williams modification of this theory. (Author)

AD-601 862 Div. 14, 4, 8, 25
OTS Price $1.75

Quantum, Inc., Wallingford, Conn.
ORGANIC SEMICONDUCTOR DEVELOPMENT.
Final rept.,
by P. M. LaFlamme and R. L. Taylor. 21 Apr 64, 68p
Contract AF19 628 2839, Proj. 8659, Task 865903
AFCRL 64 389

Unclassified report

Descriptors: (*Semiconductors, Organic materials), Metalorganic compounds, Magnesium compounds, Pyridines, Nitriles, Organic sulfur compounds, Benzenes, Synthesis (Chemistry), Purification, Zone melting, Electrical conductance, Measurement.

The organic semiconducting materials magnesium-bis (4, 4'-dipyridyl) and 4-isonitrilothioanisole were synthesized. A satisfactory method of preparing and purifying the unstable 4-isonitrilothioanisole was established. Preliminary conductivity measurements were carried out on the synthesized materials, two carbene dimers, and certain derivatives of the carbenes. It was found that these materials exhibit significant conductivity properties. The unstable isonitrile undergoes a reaction at room temperature giving what is thought to be a low polymer of the isonitrile. This material exhibits a strong EPR spectrum. A new type of electrical conductivity cell was designed and used for all conductivity measurements. (Author)

Division 14 - MATERIALS (NON-METALLIC)

AD-601 769 Div. 14, 13
OTS Price $1.00

Naval Civil Engineering Lab., Port Hueneme, Calif.
WATER VAPOR TRANSMISSION AND ELECTRICAL RESISTIVITY OF CONCRETE.
Final Technical rept.,
by Robert L. Henry. 25 Jun 64, 38p
Proj. Y R011 01 01 025
NCEL R314

Unclassified report

Descriptors: (*Concrete, Physical properties), Salinity, Sodium compounds, Chlorides, Steel, Water, Cements, Corrosion, Oleic acids, Aging (Materials), Humidity, Experimental data, Tensile properties, Reinforced concrete, Rock (Geology), Water vapor, Resistance (Electrical).

This is the final report of a study of water vapor transmission (WVT) of plain concrete and of San Gabriel rock, corrosion of steel grids, and electrical resistivity of concrete. The WVT studies involved San Gabriel rock and plain concrete with water-cement ratio, type of reinforcing steel grid, aggregate size, relative humidity, two admixtures (sodium chloride and oleic acid), and position of slice as variables in one or more of three phases of investigation. WVT rates decreased with an increase in age of concrete, in strength of concrete, in maximum aggregate size, and with the presence of 1.5 percent sodium chloride. Two kinds of steel grids--mild reinforcing steel and high-strength prestressing wire--were embedded in the 2-inch-thick concrete disks of some of the WVT specimens. Upon completion of the test, a higher percent of corrosion of steel was found in the higher water-cement ratio concrete disks; nearly all of the grids in concrete containing sodium chloride showed some corrosion. In order to determine the electrical resistivity of concrete, using the two-point method, sixteen concrete prisms were cast with carbon grids. Electrical resistivity increased with age and decreased with increased salinity of mixing water. (Author)

AD-601 808 Div. 14, 12, 17
OTS Price $1.50

Aerospace Corp., Los Angeles, Calif.
AIR PLASMA ARC MATERIALS TESTING FOR RE-ENTRY.
by D. H. Leeds, W. E. Welsh, J. I. Slaughter, and E. G. Kendall. 17 Jun 64, 57p TDR269 4240 10 11
Contract AF04 695 269
SSD TDR64 75

Unclassified report

Descriptors: (*Heat resistant materials, Tests), (*Refractory materials, Tests), (*Re-entry vehicles, Heat resistant materials), (*Test equipment, Electric arcs), Plasma physics, Subsonic flow, Air, High temperature research, Graphite, Carbides, Oxides, Hafnium, Tungsten, Titanium alloys, Zirconium alloys, Tantalum alloys, Feasibility studies.

Materials research in a sub-sonic air plasma arc, delivering a cold wall heat flux of 700 BTU/sq ft -sec for 60 sec and a cold wall heat flux of 2400 BTU/sq ft -sec for 30 sec is described. Arc cast HfC-C, ZrC-C, TiC-C, TaC-C, TiB2-B alloys are compared with commercially hot pressed HfC-C, Ti C-C, TaC-C alloys, infiltrated tungsten and sintered and forged tungsten, pressed and cast thoria and infiltrated thoria, pyrolytic and boron pyrolytic graphites, and with standards of comparison such as ATJ graphite and boron nitride. Pairs of motion pictures show a calibrated gray scale to give a brightness temperature profile, simultaneously with a record of material reactions. Measurements of mass ablation rates and longitudinal recession rates are compared. Hot and cold face temperatures on the flat faces of solid cylindrical specimens are noted. (Author)

AD-601 831 Div. 14, 29, 26
OTS Price $0.50

Prodesco, Inc., Perkasie, Pa.
DEVELOPMENT OF COTTON AND NYLON, KNITTED CLOTH WITH ELASTIC STRETCH CHARACTERISTICS.
Final rept, Jun 62-Sep 63,
by Hal E. Brockmann. May 64, 12p
Contract AF33 657 9510, Proj. 6314, Task 631401
SEG TDR64 6

Unclassified report

Descriptors: (*Gloves, Military personnel), (*Clothing, Fibers (Synethetic)), (*Textiles, Manufacturing methods), Dyes, Finishes and finishing, Data, Production, Machines, Cotton textiles, Elastic webbing, Nylon, Polyester plastics, Tensile properties, Armed forces supplies.

Blends of cotton and synthetic fibers were studied (nylon, polyester). These were knitted into fabrics to evaluate their elastic elongation, gripping characteristics, as well as non-yellowing properties in the case of white. Data are presented on the yarns and fabrics employed. The fabric was designed to provide a clean, snug fitting glove which has good gripping characteristics equal to all cotton. (Author)

AD-601 832 Div. 14, 4
OTS Price $1.25

Union Carbide European Research Associates, Brussels (Belgium).
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. SUPPLEMENT TO VOLUME XI. CHARACTERIZATION OF BINDERS USED IN THE FABRICATION OF GRAPHITE BODIES.
Supplement 1, 1 Jan-31 Dec 62,
by E. de Ruiter, J. F. M. Oth, V. Sandor, and H. Tschamler. May 64, 43p
Contract AF33 616 6915, Projs. 7350, 7381,
Tasks 735002, 738102
WADD TR61 72 V11 S1

Unclassified report

Descriptors: (*Binders, Graphite), (*Pitch (Material), Binders), Tar, Acromatic compounds, Distillation, Molecular structure, Hydrogen, Molecular weight, Heat treatment, Plasticity, Chemical properties, Physical properties, Benzenes, Pyridines, Absorption spectrum, Spectra (Infrared), Spectra (Visible and Ultraviolet).

A typical coal tar pitch was separated into fractions which were analyzed and characterized by selected physical and chemical methods. The results indicated the presence of molecules consisting of from one to several aromatic clusters, each having a mean cluster size near four aromatic rings. Information was obtained on aromaticity, hydrogen distribution and substitution index. A study was made of the effect of temperature and different atmospheres on the plasticity of the various fractions of the pitch sample. (Author)

AD-601 833 Div. 14, 4
OTS Price $2.50

National Carbon Co., Parma, Ohio.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOLUME XXXVII. STUDIES OF GRAPHITE DEPOSITED BY PYROLYTIC PROCESSES.
Rept. for May 60-May 62
by P. H. Higgs, R. L. Finicle, R. J. Bobka, E. J. Seldin, and K. J. Zeitsch. May 64, 114p
Contract AF33 616 6915 Projs. 7350, 7381,
Tasks 735002, 738102
WADD TR61 72 V37

Unclassified report

Internal friction in plastically deformed silicon and indium antimonide single crystals is measured in the 400 c/s to 80 kc/s region, at temperatures up to 1200C. The internal friction vs. temperature curves are tentatively analyzed into two overlapping parts, a Bordoni peak and a high temperature rise. Measurements of the oxygen-relaxation peak in silicon, together with an assessment of oxygen concentration from measurements of the 9 micron infrared absorption line, have allowed the dipole strength of the interstitial oxygen defect to be derived. Further studies of anneal of a deformed magnesium oxide crystal containing about 0.05% chromium show that the activation energy of the anneal is very similar to that of purer crystals, about 2eV above 450C. The disordered-strip model of dislocation damping is developed further, the theory put on a sounder basis, and the relative importance of thermodynamic and viscous damping assessed.

AD-602 012 Div. 14, 17, 25
OTS Price $2.75

Materials Research Center, Northwestern Univ., Evanston, Ill.
MATERIALS RESEARCH CENTER, ANNUAL REPORT, 1963-1964 A COMPENDIUM OF THE REPORTS OF THE INDIVIDUAL RESEARCHES .
Rept. no. 4, 1 May 63-31 Jan 64,
by J. B. Cohen, R. L. Hines, J. A. Marcus, A. W. Ewald, and R. Frerichs. 31 Jan 64, 133p
Contract SD67

Unclassified report

Research supported by Advanced Research Projects Agency.

Descriptors: (*Materials, Scientific research), Metallic crystals, Single crystals, Metals, Semiconductors, Crystal lattice defects, Thermodynamics, Inorganic compounds, Polymers, Sintering, Solid state physics, Abstracts, Symposia.

Summaries are given of current research in the fields of metallurgy, solid state physics, mechanics, and chemistry. A list of publications on related fields is included.

AD-602 030 Div. 14, 2, 31
OTS Price $0.50

Naval Applied Science Lab., Brooklyn, N. Y.
A KIT FOR SERVICE TESTS OF COMPOUND XZ-8-3057 DEICING COATING SYSTEM.
Technical memo. no. 4
[8 Jul 64], 12p
Proj. SF013 99 02, Task 0519
NASL 9300 18

Unclassified report

Descriptors: (*Ice prevention, Shipborne), (*De-icing materials, Coatings), (*Coatings, De-icing materials), Surfaces, Adhesion, Thickness, Environmental tests, Paint primers, Ship structural components, Steel, Aluminum, Brass, Siloxanes, Plastics, Naval vessels (Combatant), Paints, Wood, Instruction manuals.

This memorandum reports on the development of a deicing coating-system service-test kit which contains all of the materials and instructions necessary for preparation, application and service testing aboard ship of deicing-coating systems. The kits are intended for distribution to vessels participating in tests of deicing-coating systems under service conditions. This memorandum also reports on a service trial of a coating system (XZ-8-3057), performed with the use of such a kit, aboard the Navy minesweeper USS LIMPKIN (MSC-195). The coating system reduced the amount of work necessary for ice removal up to 30%. (Author)

AD-602 031 Div. 14, 8, 25
OTS Price $1.25

Nuclear Corp. of America, Phoenix, Ariz.
INVESTIGATION AND STUDY OF RARE-EARTH-DOPED SILICON.
Final rept.
by Carl R. Betz, Robert R. Rutherford, and Robert L. Curtis. Apr 64, 41p
Contract AF19 628 2412, Proj. 4608, Task 460804
AFCRL 64 406

Unclassified report

Descriptors: (*Semiconductors, Silicon), (*Silicon, Single crystals), (*Crystal growth, Silicon), Crystals, Impurities, Rare earth elements, Uranium, Resistance (Electrical), Diodes (Semiconductor).

A summary is given of work performed toward the objective of producing single silicon crystals doped with rare-earth elements and with uranium. Crystals were grown by various modifications of the Czochralski method, and the apparatus and techniques are described. The properties, principally the resistivity profiles, and details of doping and of growth, are included for each crystal that was grown. (Author)

AD-602 133 Div. 14, 4
OTS Price $0.50

Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENT OF A FIRE-RESISTANT WATER-BASE HYDRAULIC FLUID.
Bimonthly progress rept. no. 1, 11 May-30 Jun 64,
by E. H. Kober and G. F. Ottmann. 10 Jul 64, 17p
Contract NObs90268

Unclassified report

Descriptors: (*Hydraulic fluids, Synthesis (Chemistry)), Ethylene oxide, Amines, Phenols, Toluenes, Viscosity, Fire safety, Ignition, Temperature, Solubility.

The reaction of 2, 4-toluene diamine with both ethylene oxide and glycidol in various mole ratios afforded water-soluble products, whereas the products obtained by reacting 2, 4-toluene diamine with propylene oxide were water-insoluble. Water-soluble products were also obtained by reacting trichlorophenol with glycidol in different mole ratios. Viscosities, pour points, flash and fire points, and autogenous ignition temperatures of the water-soluble products were determined. (Author)

AD-602 155 Div. 14, 31
OTS Price $0.75

Naval Applied Science Lab., Brooklyn, N. Y.
THE NASL NOTCHED FLAT COMPRESSION TEST FOR FILAMENT WOUND MATERIALS. REINFORCED PLASTICS FOR DEEP SUBMERGENCE AND OTHER HIGH STRENGTH APPLICATIONS.
Progress rept. no. 5
by N. Fried and M. Silvergleit. [28 May 64], 21p
Proj. SR007 03 04, Task 1008
NASL 6189 5

Unclassified report

Descriptors: (*Laminated plastics, Filament wound construction), (*Filament wound construction, Compressive properties), (*Test methods, Filament wound construction), Test methods, Sheets, Reinforcing materials, Glass textiles, Epoxy plastics, Test equipment, Plastics, Failure (Mechanics), Hydrostatic pressure, Submarine hulls.

The NASAL notched flat method for determining compressive strength of filament wound materials is described. Data are presented for a series of tests, in which a number of different methods of grip construction were employed, in-

Division 14 - MATERIALS (NON-METALLIC)

AD-601 878 Div. 14
OTS Price $2.75

California Inst. of Tech, Pasadena.
THE MECHANICAL AND OPTICAL CHARACTERIZATION OF HYSOL 8705 WITH APPLICATION TO PHOTOVISCOELASTIC ANALYSIS,
by R. J. Arenz, C. W. Ferguson, T. Kunio, and M. L. Williams. Jun 64, 137p
Contract AF29 601 5367, Proj. 1080, Task 108001
WL TDR64 4

Unclassified report

Descriptors: (*Photoelasticity, Polymers), (*Polymers, Photoelasticity), (*Synthetic rubber, Photoelasticity), Mechanical properties, Shock waves, Optical properties, Loading (Mechanics), Stresses, Theory, Mathematical analysis, Rods, Strain (Mechanics), Dynamics, Propagation, Relaxation time, Wave transmission, Epoxy plastics.

The main requirement for practical photoviscoelastic analysis is optical and mechanical characterization of the material. Time-dependent characteristics of a typical low modulus polymer material, Hysol 8705, are determined from constant strain rate tests for a full range of dynamic loading rates by taking advantage of the time-temperature shift phenomenon. The theory of linear viscoelasticity is then used to construct master curve representations for all pertinent properties of Hysol 8705. A one-dimensional photoviscoelastic experimental program was conducted to generate experimental data for comparison to a corresponding theoretical problem. A comparison is made between the analytically predicted fringe patterns and the experimental results; also, available two-dimensional considerations are examined. The results indicate the feasibility of quantitative photoviscoelasticity with

AD-601 945 Div. 14
OTS Price $1.00

Reaction Motors Div., Thiokol Chemical Corp.,
Denville, N. J.
DIELECTRIC MATERIALS FOR HIGH TEMPERATURE EVALUATION.
Rept. for 16 Dec 63-30 Apr 64,
by Nathan Mayes. 30 Apr 64, 31p RMD 5038F
Contract NObs90065, Proj. SR007 03 03, Task 1000

Unclassified report

Rept. includes Appendix: Investigation of Thermal Stability of Boron-Silicone Copolymer.

Descriptors: (*Silicone plastics, Organoboranes), (*Organoboranes, Silicone plastics), (*Siloxanes, Thermal properties), (*Dielectrics, Inorganic polymers), (*Elastomers, Inorganic polymers), Plastics, Laminated glass, Polymers, Varnishes, Stereochemistry, Molecular weight, Hydrolysis, Electric motors, Polymerization.

Carborane siloxane polymers were studied as thermally stable materials. Methods of polymerization to obtain high molecular weight linear polymers were investigated. Cohydrolysis of dimethyldichlorosilane and (4-carboranyl-butyl)- methyldichlorosilane and solvent fractionation of the products yielded linear polymers of 7000-14,000 molecular weight. This preparation was scaled up to produce 21 lb of polymer which upon fractionation yielded approximately 10.5 lb of high molecular weight product. A higher molecular weight carborane siloxane elastomer was prepared by addition of butenylcarborane to a silicone gum that contained silyl hydrogens. Addition occurred readily when the reaction sites were uniformly separated but was sterically hindered when the sites were randomly located. Carborane siloxane polymers were cured, using ethoxysilane curatives and metal octoate catalysts, to investigate potential applications in varnishes, laminates, elastomers and plastics. The thermal properties of uncured and cured carborane siloxane polymers were investigated in an application study. Tests in simulated sealed electric motors at 185C showed no corrosion of the carbon brushes due to the carborane siloxane polymer. (Author)

AD-601 949 Div. 14
OTS Price $1.75

Naval Civil Engineering Lab., Port Hueneme, Calif.
PERMEABILITY OF CORAL CONCRETE.
Technical rept.,
by William R. Lorman. 16 Jun 64, 62p
Proj. Y R007 05 014
NCEL R280

Unclassified report

Descriptors: (*Concrete, Permeability), Cements, Moistureproofing, Mixtures, Shale.

The water permeability of hardened coral concrete was investigated to learn the effects of mix design factors. The independent variables were aggregate type and source, water-cement ratio, cement content, and pozzolanic admixture. The test data demonstrated that the least permeable coral concrete contained Eniwetok aggregate and after 3 months exposure had a coefficient of permeability approximating 0.000001 inches per hour for the liquid phase and approximating 0.000005 pounds per square inch per hour for the vapor phase. These values were equivalent, for all practical purposes, to the corresponding coefficients of the least permeable reference concrete. The least permeable coral concrete had a gross water-cement ratio not exceeding 5.4 gallons of water per bag of cement and a cement factor of 9.0 bags per cubic yard of concrete. The use of calcined opaline shale, as a partial replacement of portland cement, served to make the coral concrete test specimens stronger, more watertight, and more damp-proof than was otherwise possible, all other factors being equal. (Author)

AD-601 95[illegible] Div. 14, 29
OTS Price $0.50

Walter Reed Army Medical Center, Washington, D. C.
EVALUATION OF AN ACRYLATE TERPOLYMER, POLYURETHANE COMPOSITE.
Rept. for Jul 63-Jan 64
by Timothy V. Heathorn and James C. Eaton, Jr. Jun 64, 13p
Proj. 3A012501A82 03
WRAMC TR6407

Unclassified report

Descriptors: (*Gloves, Materials), (*Acrylic resins, Films), (*Isocyanate plastics, Films), Composite materials, Elastomers, Preparation, Material forming, Adhesion, Physical properties.

Composite films consisting of a flexible acrylate terpolymer substrate and an outer layer of poly (ester-urethane) elastomer were prepared and evaluated for use in cosmetic glove applications. (Author)

AD-601 991 Div. 14
OTS Price $2.25

IIT Research Inst., Chicago, Ill.
REFRACTORY INORGANIC NONMETALLIC MATERIALS, THEORY AND MECHANICAL PHENOMENA.
Rept. for 1 Apr 63-31 Mar 64
by P. D. Southgate and K. S. Mendelson. Mar 64, 81p
Contract AF33(616)8123, Proj. 7350, Task 735003
ASD TDR431 P3

Unclassified report

Descriptors: (*Refractory materials, Internal friction), (*Internal friction, Refractory materials), Inorganic compounds, Silicon, Indium alloys, Antimony alloys, Single crystals, Deformation, Crystal lattice defects, Damping, Heat of activation, Oxygen, Magnesium compounds, Monoxides, Chromium compounds, Mathematical models, Diffusion, Low frequency.

15. MATHEMATICS

AD-601 700 Div. 15
OTS Price $2.60

Case Inst. of Tech., Cleveland, Ohio.
RESTRICTION TO CUT RULE AND THE CONSISTENCY OF A NATURAL DEDUCTION ARITHMETIC.
Technical rept. no. 1,
by Clement F. Kent. 18 Jun 64, 24p
Grant Nonr G00077 64

Unclassified report

Descriptors: (*Metamathematics), (*Mathematical logic), (*Number theory), (*Recursive functions), Numbers, Transformations (Mathematics), Set theory, Theorems.

In this paper, consistency of a system called S1 sub delta is proved by generalizing arguments of Schutte's paper (Math. Ann. 122: 369-389, 1957) to prove that proofs in that system need use cut only when one premise is an induction axiom. Consistency follows quickly from this fact since it means that a quantifier-free theorem has a quantifier-free proof and, hence, a false prime formula like 0 = 1 is unprovable in the system under study. However, since this system uses a set of axioms which is productive (a productive complement of a recursively enumerable set) it is not a formal system in the usually accepted sense, and its metamathematics cannot be formalized in the more usual formal systems for arithmetic. (Author)

AD-601 736 Div. 15, 12
OTS Price $0.75

Pacific Missile Range, Point Mugu, Calif.
AN EXTREME-VALUE PROBLEM RELATED TO A SAMPLING STUDY.
Technical memo.
by M. L. Eaton. 22 Jun 64, 26p
PMR TM64 4

Unclassified report

Descriptors: (*Sampling, Population (Mathematics)), (*Probability, Theorems), (*Firing tests (Ordnance), Scheduling), Ranges (Establishments), Operations research, Statistical analysis, Integrals, Numerical analysis, Statistical distributions, Statistical functions.

This memorandum considers a problem in which a large sample called a collection is taken from a known infinite population and then the collection is sampled. Basically the problem under study is the priori comparison (difference in magnitude) of the upper bound of the collection with the upper bound of the final sample. Briefly the results of the study show that if a small difference is desired, the ratio of sample size to collection size required depends heavily on the nature of the upper tail of the density function of the original population. An increase in the upper bound of the population and an increase in the rate of decay of the density function left of the bound both tend to increase required sample size. (Author)

AD-601 741 Div. 15, 2
OTS Price $1.10

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
EXTENSIONS TO THEORY OF TIME-SERIES ANALYSIS.
Quarterly rept. no. 7, 1 Feb-30 Apr 64.
by Walter Freiberger. 30 Apr 64, 2p
Contract DA36 039sc87222, Proj. 3A99 25 002

Unclassified report

Descriptors: (*Statistical analysis, Theory), (*Series, Time), (*Statistical processes, Meteorology), (*Probability, Weather forecasting), Stochastic processes, Mathematical prediction.

This report contains abstracts of the following reports that were issued in this quarter and are being distributed with the quarterly report: (1) The analysis and prediction of meteorological fields by Walter Freiberger. (2) Statistical methods for the extrapolation of meteorological fields by A. M. Yaglom. (Author)

AD-601 812 Div. 15
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE CONTINUITY OF STRUCTURAL FUNCTIONS.
by A. A. Markov. 12 May 64, 9p
FTD TT64 475; TT 64 11805

Unclassified report

Unedited rough draft trans. of Uspekhi Matematicheskikh. Nauk (USSR) 1954 v. 9, no. 3 61 p. 226-230.

Descriptors: (*Recursive functions, Mathematical logic), (*Mathematical logic, Recursive functions), Numbers, Sequences, Real variables, Metamathematics, USSR.

AD-601 842 Div. 15
OTS Price $0.75

Cruft Lab., Harvard Univ., Cambridge, Mass.
SOME INEQUALITY CONSTRAINT PROBLEMS IN THE CALCULUS OF VARIATIONS,
by Walter F. Denham. 16 Apr 64, 27p Cruft TR-436
Contract Nonr1866 16, Proj. NR372 012

Unclassified report

Descriptors: (*Calculus of variations, Inequalities), (*Inequalities, Calculus of variations), Optimization, Control systems, Equations, Hamiltonian, Algebra, Mathematical programming.

Four related memoranda dealing with inequality constraints in the calculus of variations are collected in this report. The first is a detailed derivation of the solution to a problem appearing in (AIAA Journal I: 2544 - 2550, 1963). The second is the solution to the simplest possible problem including both a control variable and a state variable inequality constraint. The third adds a slight complexity to the second leading to transcendental equations in the solution. The fourth is a description of a straightforward method of calculating neighboring extremal paths when an interval of the nominal extremal is on a control variable or a first-order state variable inequality constraint boundary. (Author)

AD-601 844 Div. 15
OTS Price $1.00

Cruft Lab., Harvard Univ., Cambridge, Mass.
IDENTIFICATION OF LINEAR DYNAMIC SYSTEMS,
by Yu-Chi Ho and Robert C. K. Lee. 25 May 64, 31p
Cruft TR-446
Contract Nonr1866 16, Proj. NR372 012

Unclassified report

Descriptors: (*Control systems, Linear systems), (*Linear systems, Identification), Real time, Monte Carlo Method, Least squares method, Series, Stochastic processes, Mathematical prediction, Optimization, Stability.

This report presents a real time computational scheme for the identification of linear dynamic system parameters. The method is shown to be convergent under stochastic environment

dicating good reproducibility, with an overall coefficient of variation of 4.9%. For a material of 2:1 orthogonal construction, with S glass reinforcement, an average compressive strength value of 157,800 psi was obtained in the stronger ('2') direction. This value is within 5% of the average value reported for tests on cylindrical specimens, of similar construction, tested hydrostatically. Very recent data for a material of superior quality, tested by the NASL notched flat method, gave an average value of compressive strength in the '2' direction of 178,000 psi, with an individual high of 192,800 psi. Based on these data, it is believed that laminates of this type may be produced with present day materials which will have compressive strengths of 200,000 psi or higher. (Author)

AD-602 163 Div. 14, 20
OTS Price $0.75

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST. ABSTRACT NO. 24313 TO 24385, PART I.
Rept. for 1-30 Jun 64,
10 July 64, 30p REIC MAL76
Contract AF33 615 1124, continuation of
Contract AF33 657 10085

Unclassified report

Descriptors: (*Radiation chemistry,Materials), (*Bibliographies, Radiation chemistry), Abstracts, Metals, Ceramic materials, Organic materials, Polymers, Electronic equipment, Single crystals, Inorganic compounds, Radiation damage, Oscillators, Accelerometers, Nuclear reactors, Handbooks, Space environmental conditions, Radiation measurement systems.

A bibliography of 73 abstracts is given on the effects of radiation on metallic, ceramic, organic, polymeric, and inorganic materials; electronic materials, components, and devices; test facilities; space environment and effects on materials; and experimental devices and techniques.

AD-602 164 Div. 14, 20
OTS Price $0.50

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST. COORDINATE INDEX, PART II, FOR ACCESSION LISTS FROM OCTOBER 1, 1963 TO JUNE 30, 1964.
10 Jul 64, 16p

Unclassified report

Descriptors: (*Indexes, Radiation chemistry), (*Radiation chemistry, Materials), Subject indexing, Abstracts, Nuclear particles, Dosimeters, Space environmental conditions, Environment.

The inverted concept-coordinate index is a reference for the Monthly Accession List (AD-602 163). The index is subdivided into sections. The first, Radiation Environment, includes dosimetry and energy aspects of all electromagnetic and particulate radiation sources, with the exception of space radiation. Section two deals with materials, properties, secondary environment (including space environments), devices, and all other subject concepts.

AD-602 215 Div. 14
OTS Price $0.75

Boeing Co., Seattle, Wash.
MACROLAMINATE PARTICLE DEVELOPMENT.
Bi-monthly interim rept. no. 1, 1 Apr-1 Jun 64,
by F. H. Simpson. 1 Jun 64, 26p
Contract NOw64 0194f

Unclassified report

Descriptors: (*Composite materials, Laminates), (*Laminates, Composite materials), Ceramic materials, Refractory materials, Oxides, Molybdenum, Magnesium compounds, Cerium compounds, Hafnium compounds, Tensile properties, Sintering, Material forming, Oxidation, Particles, Geometric forms, Geometry, High-temperature research.

The program was established to investigate the various factors affecting the strength, ductility and oxidation resistance of a selected macrolaminate particle composite material. The investigation includes a study of particle geometry, forming methods and sintering. The ultimate objective is the development of macrolaminate particle composite materials which have sufficient tensile ductility and strength to permit their use in structural members operating in an oxidizing environment at temperatures in excess of 2000F. (Author)

AD-602 256 Div. 14, 11, 17
OTS Price $1.00

Rock Island Arsenal Lab., Ill.
THE DEVELOPMENT OF A VEHICLE CORROSION PREVENTIVE, DETROIT AREA FIELD TEST.
Interim rept.,
by Harry C. Muffley. 28 Feb 64, 34p
Proj. 1A0 24401A109
RIAL 64 661

Unclassified report

Descriptors: (*Corrosion inhibition, Tests), (*Vehicles, Corrosion inhibition), Sprays, Cleaning, Coatings, Preservation, Cargo vehicles, Passenger vehicles, Photographs, Michigan (State).

A field test was devised for the evaluation of vehicle corrosion preventives in the Detroit area. Seven compounds were selected and applied to 21 vehicles by means of an airless spray unit. A procedure for processing vehicles used in the field test was developed. This included inspections during the various stages of processing, cleaning techniques and the applications of the vehicle corrosion preventives. The procedure also indicates when to use prepared data sheets for recording observations made during the different steps of processing. Photographs of specific areas of interest on the vehicles were made and the location noted on the data sheet. (Author)

Report on project Michigan.

Descriptors: (*Control systems, Nonlinear systems), (*Nonlinear systems, Control systems), Feedback, Time, Dynamics, Stability, Differential equations, Performance (Engineering).

The partitioning technique and the state variable approach were applied to analyze and to study the behavior of a control system whose dynamic performance can in general be described by a nonlinear differential equation containing some linear terms, some nonlinear ones, and a forcing function. By placing suitable restrictions on the system equation, it was found that the state variables, which represent the state of the system, belong to an L sub 2 space. Under the assumed restrictions, the admissible system was found to satisfy the definition of asymptotic stability in the sense of Lyapunov. By use of two different definitions of the norm, the system trajectory was analyzed. During the interval of operation considered, expressions for the required norms were obtained inside which all possible states of the system remain. An example is given to illustrate the method. (Author)

AD-601 886 Div. 15
OTS Price $2.75

Purdue Univ., LaFayette, Ind.
A HANDBOOK OF STATISTICAL CLASSIFICATION TECHNIQUES.
by Carl F. Kossack. 1964, 136p
Contract Nonr1100 11

Unclassified report

Descriptors: (*Handbooks, Statistical distributions), (*Statistical distributions, Handbooks), Statistical analysis, Population (Mathematics), Statistical functions, Probability, Bibliographies.

Contents: Glossary of terms and notational conventions; A brief history of classification theory; The general characteristics of classification techniques; The illustrative example; The classification techniques- (A) Non-parametric classification, (B) Categorical classification, (C) General parametric classification, (D) The Wald classification statistic, (E) The Purdue classification statistic, (F) The Anderson classification statistic, and (G) The Shaw classification statistic; The multi-population problem; and Bibliography on classification and related topics.

AD-601 887 Div. 15, 30
OTS Price $0.50

California Univ., Los Angeles.
ON PERFORMANCE LOSSES IN SOME ADAPTIVE CONTROL SYSTEMS; I.
by Masanao Aoki. 1964, 5p
Contract Nonr233 52

Unclassified report

Session 1, Paper 5.

Descriptors: (*Adaptive control systems, Performance (Engineering)), Differential equations, Statistical functions, Partial differential equations, Mathematical analysis, Probability, Dynamic programming, Decision theory.

Concepts related to loss of performance in certain adaptive control systems are introduced. These concepts are useful in determining or in bounding possible loss in the adaptive control systems where certain parameters are not known precisely. The relation with the minimax principle in the statistical decision theory is also pointed out. Loss of performance and percentage loss of performance are approximately calculated for the sample problems in terms of moments of distribution functions which specify probability distribution of unknown parameter B. It is shown that for certain system parameter combinations, the estimate should be changed with time even though no additional information on the unknown parameter is gathered. (Author)

AD-601 911 Div. 15, 32
OTS Price $0.50

Naval Missile Center, Point Mugu, Calif.
ASSIGNED RISK AS A LOTTERY WITH A DECISION TO BE OPTIMIZED.
by M. Brown. 1 Jul 64, 13p
NMC TM64 22

Unclassified report

Descriptors: (*Decision theory, Mathematical models), (*Mathematical models, Decision theory), (*Probability, Statistical analysis), Statistical functions, Economics, Reliability, Programming (Computers), Numerical analysis, Optimization.

The assigned risk program for obtaining public liability insurance in connection with driving an automobile in California (and other places) was studied as a lottery, with a decision. A model of the lottery and a criterion for making the decision optimally were postulated. A general mathematical solution is given for the problem. This solution in nondimensional form for two distribution functions of practical numerical interest is presented. Approximate numerical results for any realistic case can be obtained readily with the help of this illustrated solution. (Author)

AD-601 978 Div. 15
OTS Price $2.60

Case Inst. of Tech., Cleveland, Ohio.
RESTRICTION OF CUT RULE AND THE CONSISTENCY OF A NATURAL DEDUCTION ARITHMETIC.
Technical rept. no. 1
by Clement F. Kent. 18 Jun 64, 24p
Grant Nonr G00077 64
AD 601 700

Unclassified report

Descriptors: (*Metamathematics), (*Mathematical logic), (*Number theory), (*Recursive functions), Numbers, Transformations (Mathematics), Set theory, Theorems.

AD-602 024 Div. 15
OTS Price $1.10

Wisconsin Univ., Madison.
THE BRANCH ALGEBRAS OF BOCHNER INTEGRABLE A-VALUED FUNCTIONS ON A LCA GROUP G. CONVOLUTION SEMIGROUPS.
by G. Philip Johnson. 8 Jun 64, 3p
Grant Nonr G00018 64
AD 601 454

Unclassified report

Descriptors: (*Algebras), (*Topology), (*Groups (Mathematics)), Mapping (Transformations), Measure theory, Tensor analysis, Algebraic topology.

AD-602 033 Div. 15, 9
OTS Price $1.75

Institute for Fluid Dynamics and Applied Mathematics.
Maryland Univ., College Park.
UNIQUENESS AND NONLINEARITY.
Doctoral thesis
by Simon A. Levin. May 64, 67p BN-354
Grant DA ARO D31 124G134
AROD 407 65

Unclassified report

Descriptors: (*Boundary value problems, Partial differential equations), (*Partial differential equations, Boundary value problems), Fluid flow, Dynamics, Integrals, Identities, Nonlinear differential equations, Differential geometry, Functions, Complex variables.

for arbitrary initial estimates of the system parameters. Experiments with second- and fourth-order systems further verify the practicality of the method. Applications of the approach to adaptive prediction and filter design are direct and obvious. (Author)

AD-601 859 Div. 15
OTS Price $2.25

Michigan State Univ., East Lansing.
QUASI-MARTINGALES AND STOCHASTIC INTEGRALS.
Technical rept. no. 1,
by Donald L. Fisk. 2 Aug 63, 95p
Contract Nonr2587 02
AD 414 838

Unclassified report

Descriptors: (*Statistical analysis, Theory), (*Integrals, Stochastic processes), (*Stochastic processes, Integrals), Measure theory, Probability, Statistical processes.

AD-601 870 Div. 15, 5
OTS Price $0.50

Michigan State Univ., East Lansing.
AN ELEMENTARY TREATMENT OF THE AMOUNT OF INFORMATION IN AN EXPERIMENT.
Technical rept. no. 2,
by Herman Rubin. 5 Sep 63, 5p MSU RM106-HR9
Contract Nonr2587 02

Unclassified report

Descriptors: (*Communication theory, Measure theory), (*Measure theory, Communication theory), Statistical distributions, Statistical functions, Probability.

This note treats the problem of information in an experiment without continuity assumptions. It is shown that, if the information function satisfies certain assumptions, then it is a multiple of the Wiener-Shannon function. (Author)

AD-601 871 Div. 15
OTS Price $0.50

Michigan State Univ., East Lansing.
SUPPORTS OF INFINITELY DIVISIBLE DISTRIBUTIONS.
Technical rept. no. 3,
by Herman Rubin. 23 Sep 63, 8p MSU RM108-HR10
Contract Nonr2587 02

Unclassified report

Descriptors: (*Statistical distributions, Distribution theory), (*Statistical processes, Statistical distributions), Series, Sequences, Number theory.

There has been a considerable amount of recent interest in the problem of characterizing absolutely continuous infinitely divisible distributions by their Levy-Khintechine representation, and in the singular case, characterizing the dimension of the support. It is easy to give examples of infinitely divisible distributions of 0-dimensional support whose convolution is absolutely continuous. This work shows that the dimension of the marginals of a process of independent stationary increments can do anything consistent with dimension increasing on convolution and the marginals possibly becoming absolutely continuous. (Author)

AD-601 872 Div. 15
OTS Price $0.50

Michigan State Univ., East Lansing.
A NEW APPROACH TO THE FOUNDATIONS OF PROBABILITY.
Technical rept. no. 4,
by Herman Rubin. 25 Sep 63, 9p MSU RM109-HR11
Contract Nonr2587 02

Unclassified report

Descriptors: (*Probability, Theory), (*Set theory, Probability), Algebras, Measure theory, Statistical functions.

In the history of the theory of probability, until recently there was no suitable foundational system on which probability calculations could be based which would yield satisfactory results. The first formulation which was adequate for general probability computations, and the only one now in wide use, is that of Kolmogoroff. However, the author claims that it is not altogether satisfactory, and gives an alternative formulation, along with showing the relationships and differences of the two approaches. The alternative formulation of probability theory is in the Von Neumann-Bernays-Godel set theory, and preserves all the theorems of the Kolmogoroff formulation. The only new results are those involving proper classes. Properties from the Kolmogoroff formulation are obtained which serve as an axiom system, and one additional axiom is added.

AD-601 873 Div. 15
OTS Price $0.50

Michigan State Univ., East Lansing.
ON A METHOD OF CONSTRUCTION OF PARTIAL GEOMETRIES AND PARTIAL BOLYAI-LOBACHEVSKY PLANES.
Technical rept. no. 5
by Esther Seiden. 4 Nov 63, 6p MSU RM110-ES6
Contract Nonr2587 02

Unclassified report

Descriptors: (*Projective geometry, Theory), Geometry, Geometric forms.

The concept of partial geometries was introduced by R. C. Bose (Strongly regular graphs, partial geometries and partially balanced block designs). The partial Bolyai-Lobachevsky planes were introduced by L. M. Graves (A finite Bolyai-Lobachevsky plane). Graves states, It would be interesting to know methods for constructing additional examples of finite B-L planes, and to learn the limitations on the number n of points on a line and the number nu of lines on a point. The purpose of this paper is to point out tha any projective plane of even order, say 2h possessing an oval, set of points no three on one line, of 2h+2 points generates two disjoint partial geometries. The dual of one of these partial geometries obtained by interchanging the roles of the points and the lines forms a B-L plane. (Author)

AD-601 874 Div. 15
OTS Price $0.50

Michigan State Univ., East Lansing.
AN ELEMENTARY CONCENTRATION INEQUALITY.
Technical rept. no. 6
by Herman Rubin. 3 Jun 64, 4p MSU RM114-HR13
Contract Nonr2587 02

Unclassified report

Descriptors: (*Statistical functions, Inequalities), (*Inequalities, Statistical functions), Measure theory, Statistical distributions, Distribution theory.

A concentration function is defined, and a theorem is proven to show its bounds. Applications of this result are given.

AD-601 877 Div. 15
OTS Price $1.00

Institute of Science and Tech., Univ. of Michigan, Ann Arbor.
STABILITY AND PERFORMANCE ANALYSIS OF A CERTAIN CLASS OF NONLINEAR TIME-VARYING FEEDBACK CONTROL SYSTEMS.
by A. Y. Bilal and Louis F. Kazda. Jun 64, 31p
IST 2900 348R
Contract DA36 039SC78801, Proj. 3D5801001

Unclassified report

The principle of maupertuis; The propagation of waves
Problems whose Lagrangian functions involve derivatives of higher order than the first
Multiple-integral problems of the calculus of variations
Constrained problems; Characteristic numbers
Multiple-integral problems whose Langrangian functions involve derivatives of higher order than the first
The Courant maximum-minimum principle

AD-602 168 Div. 15
OTS Price $0.50

Research Triangle Inst., Durham, N. C.
ON THE MEAN NUMBER OF CURVE CROSSINGS BY NON-STATIONARY NORMAL PROCESSES.
Technical rept. no. 1,
by M. R. Leadbetter and J. D. Cryer. Jul 64, 16p
Contract Nonr4565 00

Unclassified report

Descriptors: (*Statistical processes, Curve fitting), (*Curve fitting, Statistical processes), Stochastic processes, Statistical functions, Integrals, Series, Probability, Differential equations.

This report considered the mean number of crossings of an arbitrary curve, in a given time T, by a non-stationary normal process. A formula was obtained for this and sufficient conditions for its validity given. These conditions concern the behavior of the covariance function of the normal process. Incidental results include sufficient conditions for continuity of a normal (non-stationary) process x(t), and also for x(t) to satisfy a Holder condition. (Author)

AD-602 235 Div. 15, 25
OTS Price $2.00

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
ASYMPTOTIC METHODS FOR THE SOLUTION OF DISPERSIVE HYPERBOLIC EQUATIONS.
Research rept.,
by Robert M. Lewis. Apr 64, 78p EM-197
Contract AF19 628 3868, Proj. 5635, Task 563503
AFCRL 64 387

Unclassified report

Descriptors: (*Power series, Series), (*Boundary value problems, Partial differential equations), (*Partial differential equations, Boundary value problems), Matrix algebra, Hamiltonian, Differential geometry, Electromagnetism, Oscillation, Dielectrics, Electromagnetic wave reflections, Differential equations, Fourier analysis, Complex variables.

A general method is presented for finding asymptotic solutions of initial-boundary value problems for linear hyperbolic partial differential equations. A large parameter lambda appears in the equation, multiplying a lower order (dispersive) term. It also may appear in the initial data and the inhomogeneous (source) term, in a variety of ways. This gives rise to a variety of different types of asymptotic solutions. The expansion procedure is a ray method, i.e., all of the functions that appear in the expansion satisfy ordinary differential equations along certain space-time curves called rays. These rays do not lie on characteristic hypersurfaces, but instead fill out the interior of the characteristic hypercone. They are associated with an appropriately defined group velocity. The details of the expansion are presented for a simple second order hyperbolic equation. The applicability of the method to symmetric hyperbolic systems and to the integro-differential equations for dispersive dielectrics is discussed. (Author)

AD-602 255 Div. 15, 25
OTS Price $2.60

Mathematics Research Center, Univ. of Wisconsin, Madison.
THE DOMAIN OF DEPENDENCE INEQUALITY AND INITIAL-BOUNDARY VALUE PROBLEMS FOR SYMMETRIC HYPERBOLIC SYSTEMS,
by Calvin H. Wilcox. Aug 62, 24p MRC TSR333
Contract DA11 022ORD2059
AD 288 006

unclassified report

Descriptors: (*Inequalities, Partial differential equations), (*Partial differential equations, Boundary value problems), (*Boundary value problems, Theorems), Differential geometry, Integrals, Mathematical models, Diffraction, Propagation, Relativity theory, Vector analysis.

The usual systems of partial differential equations that govern wave propagation (equations of acoustics, electromagnetics, magnetohydrodynamics, elasticity, etc.) have an energy integral and corresponding Poynting vector which describes the flow of energy. The most general systems of this type were introduced by K. O. Friedrichs, who called them symmetric hyperbolic systems. In this paper, an a priori domain of dependence inequality is proved for solutions of such systems in cylindrical space-time domains subject to local, dissipative boundary conditions. The inequality expresses the fact that energy propagates with a finite speed in such systems. It is used to derive existence, uniqueness and regularity theorems for solutions of initial-boundary value problems for symmetric hyperbolic systems. These problems provide a mathematical model for the diffraction by obstacles of the waves described by such systems. (Author)

Division 15 - MATHEMATICS

Contents:
Overdetermined linear systems of partial differential equations
Applications to fluid dynamics
Nonlinear boundary problems for elliptic equations
Applications to differential geometry and further applications to fluid dynamics
Canonical forms.

AD-602 071 Div. 15, 32
OTS Price $1.00

RAND Corp., Santa Monica, Calif.
LANGUAGE IDENTIFICATION IN THE LIMIT,
by E. Mark Gold. Jul 64, 36p RM-4136PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Language, Identification), (*Mathematical logic, Language), Decision making, Artificial intelligence, Mathematical models, Numbers, Functions, Reasoning, Theory, Cybernetics.

The problem considered here is that of identifying a language of some a-priori specified class. Information concerning the language may be presented by a text, an unending succession of examples of strings in the language, or by informant, a source that tells whether or not successive strings are in the language. Decision procedures are considered which generate successive guesses as to the identity of the language, which is said to be identified in the limit if these guesses are the same and correct after some finite time. Six variations of each of the two basic identification situations are considered. It was found that identification from informant is powerful enough to identify in the limit primitive recursive languages, which include context-free languages. Use of textual information, however, is so weak that not even regular languages are limiting identifiable. (Author)

AD-602 104 Div. 15
OTS Price $10.10

Stanford Univ., Calif.
ON STATIONARY SOLUTIONS OF A STOCHASTIC DIFFERENTIAL EQUATION.
by Kiyosi Ito and Makiko Nisio. 1963 , 125p
Contracts Nonr225 28, Nonr562 29

Unclassified report

Prepared in cooperation with Brown Univ., Providence, R. I. Div. of Applied Mathematics.

Descriptors: (*Differential equations, Stochastic processes), (*Stochastic processes, Differential equations), Statistical processes, Inequalities, Integrals, Algebras, Measure theory, Set theory, Probability.

Discussed are: (1) Inequalities concerning stochastic integrals; (2) Totally bounded sets of stochastic processes; (3) The approximate sum of a stochastic intergral; (4) One-sided solutions; (5) Stationary solutions; (6) Borel algebras related to the stationary solutions; (7) Lipschitz conditions; (8) Linear coefficients; (9) Diffusion theorems; (10) A modified Girsanov example; (11) A deterministic example; and (12) A two-dimensional example.

AD-602 119 Div. 15, 12, 18
OTS Price $1.75

Space Technology Labs., Inc., Redondo Beach, Calif.
TEST OF INDIRECT METHODS OF ESTIMATING AVAILABILITY PARAMETERS.
by W. J. Howard. Jun 64, 66pSTL 6444 6042TU000
Contract AF04 694 524

Unclassified report

Descriptors: (*Mathematical prediction, Reliability), (*Mobilization, Logistics), (*Logistics, Abundance), (*Reliability, Mathematical prediction), Statistical analysis, Monte Carlo method, Least squares method, Graphics, Simulation, Feasibility studies, Checkout procedures, Guided missiles.

Several methods of estimating availability parameters are described which assume as their basis that data is provided for the number of units passing and failing checkout and for the period of time each unit stands between checkout. Each method was tested using data generated by computer simulation. The results of these tests are presented and evaluated. (Author)

AD-602 143 Div. 15
OTS Price $0.75

Coordinated Science Lab., Univ. of Illnois, Urbana.
ROLE OF THE GENERALIZED LIPSCHITZ CONDITION IN FINITE-TIME STABILITY AND IN THE DERIVATION OF THE MAXIMUM PRINCIPLE,
by S. D. Agashe. Jun 64, 28p CSL R-215
Contract DA28 043AMC00073E

Unclassified report

Descriptors: (*Differential equations, Calculus of variations), (*Calculus of variations, Differential equations), (*Control, Theory), Time, Stability, Theorems, Optimization, Control systems, Theorems, Functions, Real variables, Vector analysis.

The main purpose of the report was to show how important the generalized Lipschitz condition is in proving certain properties of varied solutions of differential equations. These are particularly useful in consideration of finite-time stability and in deriving the Pontryagin Maximum Principle. It was shown that if a system satisfies a generalized Lipschitz condition in the state variables, it is finite-time stable with respect to the initial state. If it satisifies a generalized Lipschitz condition in the control, it is finite-time stable with respect to the control. In deriving the Maximum Principle using the Calculus of Variations approach, an implicit assumption was made that for sufficiently small variations of the optimum control, the terminal conditions of the problem can still be met. This assumption was shown to be valid if a generalized Lipschitz condition is satisfied. (Author)

AD-602 166 Div. 15, 25
OTS Price $3.00

David Taylor Model Basin, Washington, D. C.
LECTURES ON APPLIED MATHEMATICS, THE CALCULUS OF VARIATIONS.
Research and development rept.,
by Francis D. Murnaghan. May 61, 177p
DTMB 1489; PB 163 339

Unclassified report

Descriptors: (*Calculus of variations, Theory), (*Mathematics, Textbooks), Mechanics, Electromagnetic waves, Propagation.

Contents:
The Lagrangian function and the parametric integrand
Extremal curves; The Euler-Lagrange equation
Lagrangian functions which are linear in x sub t
The Legendre condition for a minimal curve
Proof of the Legendre condition
Constrained problems; The Hamilton canonical equations
The reciprocity between L and H; The transversality conditions
Extremal fields; The Hilbert invariant integral
The Weierstrass E-function; Positively regular problems
A simple example of the construction of an extremal field; Rayleigh quotients and the method of Rayleigh-Ritz

The development of techniques for the mass rearing of juvenile barnacles under controlled laboratory conditions is reported, and the successful rearing of barnacle larvae through the complete juvenile cycle of metamorphoses from fertilized ova, through the six naupliar stages and the presettled cyprid stage, to settled young adult barnacles, under controlled laboratory conditions is discussed. (Author)

AD-601 789 Div. 16, 25
OTS Price $0.50

New York Univ., N. Y. Coll. of Dentistry.
MATRIX-MINERAL INTERACTION IN CALCIFIED TISSUES.
Final progress rept., 15 Jun 62-30 Nov 63,
by Otto R. Trautz. 10 Jun 64, 7p
Contract DA49 007MD765

Unclassified report

Descriptors: (*Tissues (Biology), Calcification), (*Calcification, Tissues (Biology)), Minerals, Crystallization, Salts, Chemical precipitation, Crystal structure, Calcite, Aragonite, Carbonates, Phosphates, Bicarbonates, Collagen, Catalysts, Diffraction analysis, Infrared spectroscopy, Laboratory equipment, Dentistry.

Epitactic overgrowth has been discounted as the factor responsible for the preferred orientation of apatite and other mineral salts in fibrous tissues. The precipitation diagram for the calcium-bicarbonate-phosphate system has been elaborated further to show the range of metastability and the effect of an increase in ionic strength and of elevated bicarbonate concentration on metastability of the solution and on the solubility of the precipitate. Presence of magnesium extends the field of the amorphous phase to lower calcium and higher phosphate concentrations. A scale suitable for describing in numerical terms the state of crystallinity of the precipitated materials was designed. It is an important device in the study of the effects which temperature, pH, and various impurities have on the crystallinity of the precipitate. A carbonate OH apatite has been prepared whose chemical analysis corresponds to a substitution of half of the phosphate groups by carbonate groups. Its short a-axis signifies the substitution. (Author)

AD-601 791 Div. 16
OTS Price $0.50

School of Aerospace Medicine, Brooks AFB, Tex.
STANNOUS FLUORIDE TOPICALLY APPLIED IN AQUEOUS SOLUTION IN CARIES PREVENTION IN A MILITARY POPULATION,
by Norman O. Harris, Warren R. Hester, Joseph C. Muhler, and Margaret F. Allen. May 64, 11p
Task 775659
SAM TDR64 26

Unclassified report

Descriptors: (*Teeth, Diseases), (*Diseases, Teeth) Military personnel, Dentistry, Inhibition, Fluorides, Stannates, Air force personnel, Effectiveness.

The effectiveness of a topical application of 10% stannous fluoride as an inhibitor of carious lesions in a military population was assessed from the changes in tooth surfaces determined from year-apart examinations. Treatment reduced the number of new lesions on occlusal surfaces during the year of observation. No treatment effect was observed for the other two surface types. (Author)

AD-601 792 Div. 16
OTS Price $0.50

USAF Radiation Lab., Univ. of Chicago, Ill.
INFLUENCE OF X-IRRADIATION ON DEVELOPMENT OF MICROSOME OXIDASE AND REDUCTASE ACTIVITY IN THE LIVERS OF YOUNG MALE RATS.
by Bernard E. Hietbrink and Kenneth P. Dubois. Jun 64, 10p
Contract AF41 609 1693, Proj. 7757, Task 775702
SAM TDR64 29

Unclassified report

Descriptors: (*Radiation effects, Oxidoreductases), (*Oxidoreductases, Radiation effects), Cytochemistry, Liver, Microsomes, Rats, X rays, Enzymes, Whole body irradiation, Biosynthesis, Phosphates, Sulfur compounds.

The influence of x-ray on the development of an oxidase in liver microsomes that catalyzes the oxidative desulfuration of phosphorothioates was studied. Exposure of 23-day-old male rats to 200 r or 400 r almost completely inhibited the development of phosphorothioate oxidase activity during the 3-week observation period following radiation. Substantial inhibition of the development of oxidase activity was also observed after exposure of the animals to 100 r. Marked inhibition of the development of the enzyme in the regenerating livers of partially hepatectomized rats was observed following exposure to x-ray of 200 r to 600 r. The absence of an inhibitory effect by x-irradiation on phosphorothioate oxidizing activity of the livers of adult male rats suggests that the effect of x-ray is on some process involved in the synthesis of phosphorothioate oxidase. X-irradiation had no effect on the development of reductase activity in the livers of young rats indicating selectivity in the action of x-ray on the development of microsome enzymes. (Author)

AD-601 801 Div. 16
OTS Price $0.50

Missouri Univ., Kansas City. School of Dentistry.
EVALUATION OF CLINICAL PROCEDURES IN DENTISTRY.
Annual progress rept., 1 Jan-31 May 64,
by Hamilton B. G. Robinson and Jack L. Stewart. 15 Jun 64, 18p
Contract DA49 193md2561

Unclassified report

Descriptors: (*Dentistry, Medical research), (*Time studies), Dental personnel, Medical examination, Teeth, Ultrasonic radiation, Effectiveness, Computers, Recording systems, Records, X-ray photography, Radiography, Automation, Infrared radiation, Data storage systems, Reading machines.

Progress on a comparative study between the use of conventional dental procedures and newer or modified techniques is reported. The aim of this project is to determine the most effective utilization of the Army's dental manpower. Data collected on the relative value of ultrasonics and the conventional method for scaling teeth is being analyzed by computers to establish the effectiveness as a function of time. Preliminary data on a study using dictating and transcribing equipment for clinical examination charting shows that the present methods used by the Army are faster. The use of the panoramic radiographic method for X-ray examination shows an 87% saving of time. Experiments are being conducted with various forms of radiant energy as a means of heating dental alloys. An examination and treatment chart was designed for automation of the oral health records. This is an 8 by 11 inch mark sense source document to be used with the 1231 (IBM) Optical Mark Page Reader. Further development of this chart which was found necessary is in progress.

16. MEDICAL SCIENCES

AD-601 689 Div. 16
OTS Price $1.60

Rome Univ. (Italy).
NEUROPHYSIOLOGICAL STUDIES OF BEHAVIOUR.
Final technical rept., 1 Apr 63-31 Mar 64,
by Gianfranco Ricci. 1 May 64. 12p
Grant AF EOAR63 90
AFOSR 64 1089

Unclassified report

Descriptors: (*Psychophysiology, Behavior), (*Behavior, Psychophysiology), *Psychotropic agents, Electroencephalography, Parasympatholytic agents, Atropine, Amphetamines, Belladonna alkaloids, Conditioned reflex, Stimulation, Cerebral cortex, Cerebrum, Monkeys, Electrodes, Drugs, Brain.

The results of the investigation of (1) behavior and EEg modifications induced by anticholinergic drugs and their combination with amphetamine, (2) modifications of cortical evoked responses after administration of atropine and amphetamine, and (3) modifications of the responses evoked in subcortical structures during avoidance conditioning experiments in the monkey are summarized. Small doses of amphetamine given to animals previously treated with anticholinergic agents restored the conditioned responses while not modifying the EEG activity. The cholinolytic drugs potentiated the excitatory effects of amphetamine. Amphetamine, given to previously atropinized animals restored the stage of diminished amplitude of the cortical responses both in the somatic and visual areas, in spite of the absence of clear-cut EEG modifications. A method was devised for implanting multiple electrodes in deep structures of the brain of the monkey. The preliminary results obtained with the study of the responses evoked in these structures during avoidance conditioning experiments are reported.

AD-601 731 Div. 16
OTS Price $5.60

Siena Univ. (Italy)
CENTRAL NERVOUS MECHANISMS IN CIRCULATION REGULATION.
Final rept.,
by Cesare Bartorelli and Alberto Zanchetti.
26 May 64, 57p
Contract AF61 052 253
AFOSR 64 1133

Unclassified report

Descriptors: (*Central nervous system, Blood circulation), (*Blood circulation, Central nervous system), Reflexes, Arteries, Chemoreceptors, Aorta, Blood pressure, Stimulation, Autonomic nervous system, Miniature electrical equipment, Neuromuscular transmission, Emotions, Adaptation (Physiology), Behavior, Brain, Electroencephalography, Thalamus, Sleep, Nerves.

Contents:
Central excitatory state and circulatory reflexes
Ascending brain stem mechanisms regulating consciousness and emotional behavior
Evoked electrical activity in the hypothalamus of the cat
Comparison between regulation of waking behavior and hypothalmic rage activity

AD-601 747 Div. 16
OTS Price $1.10

Columbia Univ., New York.
THE DEVELOPMENT OF FUNCTIONAL CELL STRAINS.
Annual progress rept., 1 Jul 63-30 Jun 64,
by Samuel Graff. 8 Jun 64, 6p
Contract Nonr266 76

Unclassified report

Descriptors: (*Cells (Biology), Growth), Biological laboratories, Laboratory equipment, Culture media, Simulation, Reproduction, Cell division, Viruses, Biosynthesis, Inhibition, Tissues (Biology), Cytochemistry, Glycolysis.

Three different cell culture devices have been developed which makes it possible to simulate in vivo conditions of cell growth under rigidly controlled conditions. The cytogenerator is a perfused suspension system in which the cell population is retained wholly within the growth chamber. The chemostat is a devise in which the population of logarithmically replicating cells is held constant by harvesting the cells at their replication rate. The pachycytogenerator is a device for growing solid masses of cells in an artificial stroma in vitro to more nearly simulate in vivo conditions of cell growth. Using these devices, an extensive analysis of the population dynamics and transition states of cells cultivated in vitro was completed. It was demonstrated that glycolysis is a transitory defense mechanism against excess glucose influx. Animal cells were found to react to virus infections by synthesizing a substance which inhibits viral replication. The immediate and long range plans for further research in cell culture are briefly outlined.

AD-601 757 Div. 16
OTS Price $6.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TRANSACTIONS OF THE TOMSK SCIENTIFIC RESEARCH INSTITUTE OF VACCINS AND SERUMS.
1 May 64, 412p
FTD TT63 1082 TT 64 11796

Unclassified report

Unedited rough draft trans. of Nauchno-Issledovatel'skii Institut Vaktsin i Syvorotok, Tomsk. Trudy (USSR) 1960, v. 11, 327p.

Descriptors: (*Medical research), (*Infectious diseases), Vaccines, Immune serums, Epidemiology, Microbiology, Disease vectors, Ticks, Arthropods, Rodents, Viruses, Virus diseases, Public health, Antigens and antibodies, Antigen-antibody reactions, Diseases, Arboviruses, Liptospira, Coxiella, Poliomyelitis virus, Salmonella, USSR.

The material presented volume is essentially a summary of its activity during the year 1957. It contains 53 scientific reports. Two basic problems, the epidemiology and microbiology of the kray, now constitute 75-80% of the entire scientific work of the institute, special attention being paid to the study of natural-nidus diseases and the development of a scientific basis for the production of bacterial preparations. This book contains individual fragments of doctoral and graduate dissertations prepared at the Stalinsk GIDUV [State Institute for the Specialization and Advanced Training of Physicians] and other laboratories and institutions working in these fields under the supervision of the Tomsk NIIVS.

AD-601 783 Div. 16, 31
OTS Price $0.50

Naval Applied Science Lab., Brooklyn, N. Y.
A REPORT OF THE MASS-REARING OF SETTLED BARNACLE CYPRIDS IN THE LABORATORY.
Technical memo. no. 2
17 Jun 64, 7p
Proj. SR007 08 05, Task 1201
NASL 9300 22 TM2

Unclassified report

Descriptors: (*Barnacles, Growth), Marine biology, Biological laboratories, Crustaceans, Larvae, Antifouling coatings, Test methods.

AD-601 953 Div. 16, 14
OTS Price $0.50

Walter Reed Army Medical Center, Washington, D. C.
PHYSICAL EVALUATION OF ACRYLATE CARTILAGE SUBSTITUTE IN VITRO.
Rept. for Apr-May 64,
by John Hodge, Jr. and Joshua Nelson. May 64, 13p
Proj. 3A012501A82 03
WRAMC TR6403

Unclassified report

Descriptors: (*Acrylic resins, Cartilage), (*Cartilage, Acrylic resins), Elastomers, Water, Physical properties, Bone, Legs, Joints (Physiology), Prosthetics, Surgery, Formaldehyde, Stress (Physiology), Body fluids.

An acrylate terpolymer was evaluated for effects of autoclaving and water immersion on bulk physical properties. In general, autoclaving of the material appeared to have little or no effect on physical properties. However, water immersion of the acrylate elastomer, both non-reinforced and reinforced, results in severe lowering of strength properties. (Author)

AD-601 992 Div. 16
OTS Price $0.75

Naval School of Aviation Medicine, Pensacola, Fla.
INTERDEPENDENCE AMONG SOME FACTORS ASSOCIATED WITH CORONARY HEART DISEASE.
Rept. no. 9
by Albert Oberman, Richard E. Doll and Ashton Graybiel.
5 Mar 64, 21p
Proj. MR005 13 3001, Task 2

Unclassified report

Descriptors: (*Cardiovascular diseases, Etiology), (*Heart, Pathology), Physical fitness, Correlation techniques, Public health, Job analysis, Alcohols, Obesity, Blood pressure, Cholesterol, Atherosclerosis, Hypertension, Males, Aviation personnel, Naval personnel, Medical examination, Body weight, Statistical tests, Aviation medicine.

Interrelations among certain factors predisposing to coronary heart disease were evaluated in a prospective study of healthy young men followed for an 18-year period. Analyses of these noncontinuous data by means of chi squares and contingency coefficients reveal significant associations. Pertinent findings are discussed in relation to present knowledge of the epidemiology of coronary heart disease. (Author)

AD-602 011 Div. 16
OTS Price $0.50

Pavia Univ. (Italy).
FINAL TECHNICAL REPORT. ARTHROPODS WHICH PRODUCE TOXIC SUBSTANCES AND METHODS FOR COLLECTION, EXTRACTION AND PRESERVATION OF TOXINS FROM THESE ARTHROPODS.
Rept. for 1 Apr 63-31 Mar 64
by Mario Pavan. 20 May 64, 13p
Contract DA91 591EUC2674

Unclassified report

Descriptors: (*Arthropods, Toxins and antitoxins), (*Toxins and antitoxins, Arthropods), Arachnids, Crustacea, Hymenoptera, Lepidoptera, Coleoptera, Insects, Collecting methods, Preservation, Purification, Tropical regions, Chromatographic analysis, Histological techniques, Congo (Leopoldville), Venoms.

AD-602 029 Div. 16, 31
OTS Price $0.50

Naval Applied Science Lab., Brooklyn, N. Y.
A SUMMARY OF THE DEVELOPMENT OF PROCEDURES FOR LABORATORY MARINE-FOULING STUDIES, PART 2.
Technical memo no. 3.
8 Jul 64 , 16p
Proj. SR007 08 05, Task 1201
NASL 9300 22

Unclassified report

Descriptors: (*Barnacles, Growth), (*Fouling, Barnacles), Biological laboratories, Laboratory equipment, Antifouling coatings, Food, Algae, Metal poisoning, Glass, Infections, Sea water, Marine biology, Test methods, Crustacea.

The development of procedures for the rearing of barnacles in the laboratory and for the study of the settlement of these barnacles upon test surfaces under completely controlled conditions is discussed. Categories include: development of procedures for maintaining and feeding juvenile barnacles in the laboratory; design of special equipment and techniques which are required for laboratory fouling methodology; and rearing of juvenile barnacles from embryo through successive naupliar and cyprid stages.

AD-602 100 Div. 16
OTS Price $4.00

Army Inst. of Dental Research, Walter Reed Army Medical Center, Washington, D. C.
ANNUAL PROGRESS REPORT PREVENTIVE DENTISTRY .
Rept. for 1 Jul 63-30 Jun 64.
30 Jun 64, 263p
Proj. 3A012501A8070101

Unclassified report

Descriptors: (*Dentistry, Military personnel), (*Teeth, Diseases), Medicine, Public health, Face, Mouth, Bones, Microbiology, Biochemistry, Physiology, Epidemiology, Neoplasms, Cancer, Southeast Asia, Malaya, Burma, Thailand, Abstracts.

Contents:
Preventive dentistry
Oral pathology
Dental materials
Maxillofacial surgery
Simplification of methods to maintain oral health
Oral microbiology
Oral biochemistry
Oral physiology

AD-602 106 Div. 16
OTS Price $0.75

New York Univ., N. Y. Coll. of Medicine.
IDENTIFICATION AND ROLE OF NON-SEBACEOUS KERATIN LIPIDS IN SKIN.
Final rept. for 1 Jul 63-30 Jun 64,
by Victor R. Wheatley. 29 Jun 64, 21p
Contract DA18 108AMC165A

Unclassified report

Descriptors: (*Lipoproteins, Skin), (*Integumentary diseases, Lipids), Pathology, Fatty acids, Solubility, Chromatographic analysis, Distillation, Tissues (Biology), Biochemistry, Chemical analysis.

The presence of appreciable amounts of lipid material (2.7 to 9.1%) in both normal and pathological horny layer material was confirmed. The lipid occurred both as free lipids and as protein-lipid complexes, and two types of lipids were recognized. One can be removed from the horny layer by extraction with alcohol, while the latter requires more drastic

Division 16 - MEDICAL SCIENCES

AD-601 827 Div. 16
OTS Price $5.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CERTAIN PROBLEMS IN THE INFLUENCE OF IONIZING RADIATION ON THE NERVOUS SYSTEM,
by M. N. Livanov. 4 May 64, 334p
FTD TT63 582; TT 64 11808

Unclassified report

Unedited rough draft trans. of mono. Nekotorye Problemy Deistviya Ioniziruyushcheni Radiatsii na Nervnuyu Sistemy, Moscow, 1962, 196p.

Descriptors: (*Radiation effects, Nervous system), (*Nervous system, Radiation effects), Sensitivity, Radiation tolerance, Radiological dosage, Cerebral cortex, Thalamus, Eye, Central nervous system, Spinal cord, Thresholds (Physiology), Reflexes, Conditioned reflex, Autonomic nervous system, Radiation sickness, Neuromuscular transmission, Adaptation (Physiology), Vestibular apparatus, Peripheral nervous system, Ionization.

Contents:
Sensitivity of the nervous system to exposure to ionizing radiation,
Basic mechanisms of ionizing radiation effect on the nervous system,
The intercentral relations in experimental radiation sickness,
Hypothalamus as a factor in experimental acute radiation sickness,
Interdependence of some body functions and successive states affecting the cerebral cortex, induced by ionizing radiation.

AD-601 841 Div. 16
OTS Price $0.75

Kansas Univ., Kansas City. School of Medicine.
PATHOGENESIS OF SCRUB TYPHUS INFECTION (RICKETTSIA TSUTSUGAMUSHI AS STUDIED BY IMMUNOFLUORESENCE 1, 2.,
by W. D. Kundin, Chien Liu, Patricia Harmon, and Patricia Rodina. 1963, 28p

Unclassified report

Descriptors: (*Rickettsia Tsutsugamushi, Radiation effects), (*Rickettsia, Diseases), Infectious diseases, Radiobiology, Immunology, Pathology, Antigens and antibodies, Growth, Viability, Histological techniques, Tissues (Biology), Immune serums, Laboratory animals, Mice, Anatomy, Biological laboratories, Contamination, Fluorescence.

The pathogenesis of R. tsutsugamushi in infected suckling and weanling mice was studied by the use of fluorescein-labeled antibodies. Although the areas of involvement differed with the route of inoculation, rickettsial antigen was observed primarily in connective tissues of mesenchymal origin. X-irradiation increased the mortality, shortened the incubation period and intensified the antigenic involvement. Rickettsiae could be found by infectivity titrations but not be fluorescent antibody staining in mice infected up to a year before. Attempts to cause a recrudescence by the use of various stresses were unsuccessful. (Author)

AD 601 916 Div. 16, 32
OTS Price $0.50

George Washington Univ., Washington, D. C.
MILITARY ENTOMOLOGY INFORMATION SERVICE.
Annual progress rept., 1 Jul 63-30 Jun 64,
by Charles W. Shilling. 30 Jun 64, 4p
Contract DA49 193MD2475

Unclassified report

Descriptors: (*Insects, Pest control), (*Medical research, Insects), Military publications, Military medicine, Scientific personnel, Department of Defense, Information retrieval, Standards, Geography, Subject indexing, Documentation.

The report covers the administrative operation of the Military Entomolgy Information Service of the DoD's Armed Forces Pest Control Board. This Service is responsive to operational and research needs within the interdisciplinary areas comprising entomology. During the period 1 July 1963 to 30 June 1964 the following took place: personnel changes, 8,000 accessions to the optical concidence system, equipment expansion, microthesaurus development coordinated with DDC, geographic area kits developed and queries answered on 20 such areas, SDI on specialties forwarded to entomologists, and plans for accession expansion. (Author)

AD-601 934 Div. 16
OTS Price $0.75

Walter Reed Army Medical Center, Washington, D. C.
ANNUAL PROGRESS REPORT, CARDIOLOGY SERVICE.
Rept. for 1 Jul 63-30 Jun 64
by T. W. Mattingly, Edward J. Kamin, Robert J. Hall, and Weldon J. Walker. 30 Jun 64, 22p
Projs. 6X60 01 001, 6X97 87 001

Unclassified report

Report on Internal Medicine and Clinical Investigations.

Descriptors: (*Cardiovascular diseases, Medical research), (*Medical research, Cardiovascular diseases), (*Cardiography), (*Electrocardiography), (*Heart), Pathology, Diagnosis, Atherosclerosis, Thrombosis, Hemorrhage, Arrhythmia, Anemias, Electrolytes (Physiology), Hypertension, Lipoproteins, Cholesterol, Physical fitness, Blood pressure, Obstruction (Physiology).

Cardiological studies made during the period from 1 July 1963 to 30 June 1964 are reported. Topics include: (1) the value of double standard two-step test in detecting coronary disease; (2) prognosis of bundle branch block and conduction defects; (3) detection of asymptomatic coronary disease; (4) the natural history of ventricular septal defect; and (5) predisposing factors in coronary heart desease in young males. (Author)

AD-601 939 Div. 16
OTS Price $1.00

Boston Univ., Mass.
PULMONARY VENTILATION AND DIFFUSION IN SHOCK.
Annual rept. for 1 Jun 63-31 May 64
by John J. Byrne, John J. Cahill, Edward A. Gaensler, and Denise Jouasset-Strieder. 1 Jun 64, 32p
Contract DA49 193MD2206

Unclassified report

Descriptors: (*Shock (Pathology), Analysis), (*Lungs, Stress (Physiology)), (*Heparin), Capillaries, Toxins and antitoxins, Blood volume, Blood platelets, Blood pressure, Blood transfusions, Anesthesia, Hemorrhage, Arteries, Cannulation, Drugs, Diffusion, Embolism, Serotonin, Hysteresis, Anemias, Oxygen, Escherichia coli, Blood coagulation, Hypotension, Surface tension, Autonomic agents, Carbon compounds, Monoxides.

Injection of endotoxin in dogs resulted in a sudden fall in compliance and a rise in resistance to airflow immediately following injection. These changes were transitory and less constant in animals which were heparinized. Further studies of pulmonary diffusion in dogs confirmed the fall in the diffusion capacity for carbon monoxide (DLCO) and in lung capillary blood volume (Vc) during both acute and irreversible shock. The fall in DLCO was always proportional to the volume of red blood cells in the lung capillaries (Vrbc). The fall in Vc was not related to the duration of the anesthesia nor to the retransfusion of blood. Control studies were carried out as a preliminary to the evaluation of patients in shock. (Author)

Data obtained in three different studies related to measurement of forces on the body due to air movement are summarized. The effects of short duration blast forces on personnel seated or standing at various distances from openings during pressure loss, blast forces necessary to disorient the body from numerous positions, effects of clothing on the drag forces, and measurements of forces and moments on the body during wind tunnel tests are discussed and compared. (Author)

AD-602 210 Div. 16
OTS Price $0.50

Naval School of Aviation Medicine, Pensacola, Fla.
USE OF CALORIC TEST IN EVALUATING THE EFFECTS OF GRAVITY ON CUPULA DISPLACEMENT.
Joint research rept.,
by Michael E. McLeod and Manning J. Correia. 2 Apr 64, 16p
Proj. MR005 13 6001; NASA Order R93, Task 1
NSAM RR94

Unclassified report

Descriptors: (*Acceleration tolerance, Semicircular canals), (*Semicircular canals, Acceleration tolerance), Ear, Eye, Temperature, Stimulation, Gravity (Artificial), Thermistors, Cornea, Retina, Water, Velocity, Lymph.

Sixteen subjects were given caloric stimulation while lying in prone and supine body positions. It was found that the nystagmic response in the supine position was significantly greater than the response in the prone position. These findings cannot be explained on the basis of a cupula-gravity interaction, assuming the cupula is heavier than the surrounding endolymph. (Author)

AD-602 231 Div. 16
OTS Price $9.60

Illinois Univ., Urbana.
CHEMICAL AND PHYSICAL STUDIES ON RABBIT MUSCLE ENOLASE.
Doctoral thesis,
by Jack Alan Winstead. 1964, 116p

Unclassified report

Descriptors: (*Muscles, Enzymes), (*Enzymes, Muscles), Biochemistry, Rabbits, Physical properties, Chemical properties, Chemical analysis, Muscle proteins, Aldehyde lyases, Carbon-carbon lyases, Molecular association, Peptides, Amino acids, Fluorescence, Spectroscopy, Peptide hydrolases.

The end-groups of rabbit muscle enolase were elucidated. Two moles of amino-terminal N-acetylalanine and two moles of carboxy-terminal -lys-ala-lys were found per 82,000 gm of enzyme, thus establishing chemical evidence for two polypeptide chains in the active enzyme. Enolase was found to dissociate in two organic solvent systems. In each case three components were found necessary for rapid dissociation, organic solvent, ammonium sulfate, and versene. Ammonium sulfate was found to dissociate enolase, the sedimentation coefficient decreasing as the salt concentration was increased. A mechanism for the effect of salt on enolase, involving both dissociation and unfolding, was proposed to explain the data. The subunits of enolase in 2 M ammonium sulfate and in the dioxane system were investigated by fluorescence polarization, fluorescence and absorption spectroscopy and optical rotatory dispersion and compared with native enolase. The dimer of enolase was shown to be the active form of this enzyme in dilute solutions. Also, new assay conditions were found which would increase the specific activity from 375 to 570 units per mg. Enolase most probably crystallizes in an inactive form which can readily be converted to the active dimer by dissolving in dilute buffer.

AD-602 233 Div. 16
OTS Price $4.60

Bryn Mawr Hospital, Pa.
PRESERVATION OF RED CELLS IN THE FROZEN STATE WITH THE AID OF SUGARS AND MACROMOLECULAR ADDITIVES. EFFECT OF LACTOSE, DEXTRAN AND ALBUMIN ON RECOVERY AND SURVIVAL OF FROZEN RED CELLS.
Progress rept. no. 55,
by Max M. Strumia. 30 Jun 64, 50p
Contract da49 193md2084

Unclassified report

Descriptors: (*Erythrocytes, Preservation), (*Blood, Freezing), (*Blood transfusions), Lactose, Dextran, Serum albumin, Storage, Potassium, Hemoglobin, Hemolysis, Blood plasma, Radioactive isotopes, Halocarbon plastics.

Modification of red cells with lactose solution, removal of the modifying agent, and freezing in Teflon containers with the addition of the low molecular weight dextran resulted in the recovery of 98.5% of the red cells; when albumin was used the recovery rate of red cells was 98.57%. A mean survival of 69.9% of red cells was obtained 24 hours post-transfusion, when dextran was used as the additive after modification with lactose. Dimensional changes, stability and O2 dissociation of frozen red cells are described; the relationship of the mean corpuscular volume to survival is discussed. There was evidence that the chromium tag of red cells, frozen with the addition of lactose followed by dextran, is labile; this suggested the necessity to re-evaluate the posttransfusion survival of red cells, frozen with the present technique, with the nonagglutinable cell method. (Author)

AD-602 239 Div. 16
OTS Price $1.00

Harry Diamond Labs., Washington, D. C.
A TWO-STAGE DIGITAL AMPLIFIER APPLIED TO THE ARMY ARTIFICIAL HEART PUMP,
by Carl J. Campagnuolo, Chris E. Spyropoulos and Henrik H. Straub. 30 Apr 64, 32p
Projs. 1P010501A001, 31100
HDL TR-1220

Unclassified report

Descriptors: (*Mechanical organs, Fluid flow), (*Heart, Medical equipment), Pneumatic systems, Gas flow, Pulse rate, Amplifiers, Cannulation, Surgical techniques, Blood transfusions, Blood circulation, Pressure, Design, Specifications.

A two-stage fluid amplifier was designed and evaluated for use with the army artificial heart pump. The stages were of the digital type, having preestablished characteristics, such that their cascaded output is applicable to the heart pump. Tests showed that the two-stage amplifier yields total pressure recoveries up to 50 percent. Output flows of the pump were considerably higher than those of a single-stage heart pump for similar input air pressures. However, the input air flow to the two-stage amplifier was also higher than that for the single amplifier. This high flow can be decreased by decreasing the nozzle areas of the two stages. (Author)

AD-602 250 Div. 16, 4, 14
OTS Price $0.50

Walter Reed Army Medical Center, Washington, D. C.
BIOCHEMICAL DEGRADATION OF POLYMERS.
Rept. for Jan-May 64,
by R. K. Kulkarni. Jun 64, 14p
Proj. 3A012501A802 03
WRAMC TR6406

Unclassified report

extraction procedures. Both lipids are exceedingly complex in nature. Three major groups of proteolipids were demonstrated in the alcohol-soluble lipids, one of which consists of sterol-proteolipids. At least ten different proteolipids are believed to be present. On hydrolysis the mixed proteolipids yielded free fatty acids, free sterols, phosphatides, hydrocarbons, waxes, sterol esters and triglycerides. No definite chemical structure can yet be assigned to any of these proteolipids. Differences were observed in the nature of the horny layer lipids in certain scaly dermatoses. It is considered that these differences are related to the loss of barrier function of the skin in such conditions. It is believed that these proteolipids play an essential role in the keratinization process and in the barrier function of normal skin. (Author)

AD-602 135 Div. 16
OTS Price $6.00

Notre Dame Univ., Ind.
CHRONIC EFFECTS OF IONIZING RADIATION ON THE HEMATOPOIETIC SYSTEM.
Final technical rept.,
by Charles E. Brambel. 1 Jul 64, 497p
Contract DA49 007MD955, Task 03 077

Unclassified report

Descriptors: (*Radiation effects, Hemopoietic system), (*Hemopoietic system, Radiation effects), Ionization, Rats, Gamma rays, Cells (Biology), Blood cells, Radiation sickness, Radiological dosage, Spleen, Excision, Erythrocytes, Dose rate, Stress (Physiology), Lymphatic system, Bone marrow, Thymus, Growth, Aging (Physiology), Temperature, Cold environment, Females.

The cellular and biochemical basis for the cumulative damage manifested in the immature and mature female rats during their maintenance in the selected low level gamma radiation environments were studied. Frequent quantitative measurements were made of the cellular composition of blood and blood forming tissues and of the major protein components of serum. Massive recovery of splenic erythropoiesis under continuous radiation exposure in the absence of marrow recovery was noted. This pointed to a potential role of the spleen for survival under the experimental conditions used, and comparisons of splenectomized with non-splenectomized animals were also performed. Experiments have been started to provide information on post-radiation survival after continuous exposure to ascertain late effects of radiation including stress situations such as heat and cold. (Author)

AD-602 174 Div. 16
OTS Price $7.00

Brooke Army Medical Center, Fort Sam Houston, Tex.
ANNUAL RESEARCH REPORT FY 1964,
30 Jun 64, 584p
Projs. 3A012501A802, 3A012501B813

Unclassified report

Descriptors: (*Shock (Pathology), Battle injuries), (*Battle injuries, Shock (Pathology), (*Burns, Battle injuries), (*Kidneys, Battle injuries), Mechanical organs, Transplantation, Kidney function tests, Thrombosis, Surgery, Dextran, Plasma substitutes, Blood volume, Hemorrhage, Infections, Antibiotics, Pancreas, Electrolytes (Physiology), Bacteriophages, Hypoxia.

Summaries of research related to combat truama and surgery are presented. Included are 23 reports on renal function and therapy in kidney trauma, and 37 reports on the pathology therapy and prophylaxis in burn injury.

AD-602 204 Div. 16, 29
OTS Price $1.10

Civil Aeromedical Research Inst., Oklahoma City, Okla.
THE FLAMMABILITY OF LIP, FACE AND HAIR PREPARATIONS IN THE PRESENCE OF 100% OXYGEN,
by J. Robert Dille, Charles R. Crane, and George E. Pendergrass. Nov 63, 8p
CARI 63 27

Unclassified report

Descriptors: (*Aviation safety, Toilet articles), (*Toilet articles, Flammability), (*Oxygen, Aviation safety), Aviation medicine, Fires, Burns, Face, Hair, Explosions, Pressure, Wounds and injuries, High pressure research, Sparks, Hydrocarbons, Hazards.

The effects of high concentrations and pressures of oxygen and of static sparks upon lip, face and hair preparations were determined because of questions that frequently arise and apprehension that exists. A wide margin of safety was found for their use at or below one atmosphere of pressure. However, their use in experimental or therapeutic compressions is not deemed safe due to a marked increase in the effects of a static spark upon these compounds at two atmospheres oxygen pressure. (Author)

AD-602 206 Div. 16
OTS Price $1.60

Civil Aeromedical Research Inst., Oklahoma City, Okla.
ACUTE AND CHRONIC EFFECTS OF THE INSECTICIDE ENDRIN ON RENAL FUNCTION AND RENAL HEMODYNAMICS,
by D. A. Reins, D. D. Holmes, and L. B. Hinshaw.
Oct 63, 14p
CARI 63 26

Unclassified report

Descriptors: (*Insecticides, Toxicity), (*Toxicity, Insecticides), Kidneys, Kidney function tests, Hypertension, Hypotension, Blood circulation, Vasoactive agents, Blood volume, Symphathomimetic agents, Dogs, Injection (Medicine), Poisoning, Hydrocarbons.

Chronic and acute effects of the insecticide endrin on renal function were studied in dogs. Animals were exposed to endrin chronically by intramuscular injection and acutely by intravenous infusion. In acute studies dogs developed systemic hypertension and increased renal vascular resistance attributable to a sympatho-adrenal action. Basic renal autoregulation was not impaired by endrin but was masked by effects of blood borne adrenergic agents. Changes in renal function were minimal. In chronic studies dogs developed progressive systemic hypotension with variable changes in renal function and terminal renal vasodilation in some instances. Pathological findings were minimal and could be related to hemodynamic alterations in the peripheral vasculature. Results from this investigation provide no evidence for renalfailure due to chronic insecticide poisoning. (Author)

AD-602 207 Div. 16
OTS Price $1.60

Civil Aeromedical Research Inst., Oklahoma City, Okla.
STUDIES OF AIR LOADS ON MAN,
by John J. Swearingen and Ernest B. McFadden. May 63, 12p
CARI 63 9

Unclassified report

Descriptors: (*Gust loads, Aviation medicine), (*Aviation medicine, Gust loads), Wind tunnel models, Adaptation (Physiology), Aerodynamic loading, Wind, Pressurized cabins, Shock waves, Gust loads, Aviation personnel, Posture, Drag.

17. METALLURGY

AD-601 702 Div. 17
OTS Price $12.50

Mechanical Technology Inc., Latham, N. Y.
CREEP AND FATIGUE CRITERIA FOR HIGH-TEMPERATURE TURBOCOMPRESSOR LOOP MATERIALS.
Technical memo.,
by R. L. Thorkildsen. 27 Dec 63, 176p MTI 63TM8
Contract DA44 009AMC316X

Unclassified report

Descriptors: (*Alloys, Mechanical properties), *Creep, *Fatigue (Mechanics), Turbine parts, Compressor parts, Mathematical analysis, Stresses, Structures, Steel, Chromium alloys, Molybdenum alloys, Aluminum alloy, Thermal stresses, Experimental data.

An analysis of the problems of creep-fracture and fatigue is presented, with the emphasis on generating criteria for the design of a high-temperature closed-cycle turbocompressor loop. Recommendations are made for specific design equations which can be used to predict the effects of factors such as stress concentrations, temperature, mean stress and cumulative damage on high- and low-cycle fatigue, thermal fatigue and creep-fracture. A summary of design equations is given. A detailed critique of the subject, which serves as the basis for these recommendations, is given. (Author)

AD-601 740 Div. 17
OTS Price $1.00

Metals and Controls, Inc., Attleboro, Mass.
STUDY OF DUCTILE COATINGS FOR THE OXIDATION PROTECTION OF COLUMBIUM AND MOLYBDENUM ALLOYS.
Bimonthly progress rept. no. 5, 1 Mar-30 Apr 64.
31 May 64, 35p
Contract NOw63 0706c

Unclassified report

Descriptors: (*Metal coatings, Corrosion inhibition), (*Niobium alloys, Coatings), (*Molybdenum alloys, Coatings), Oxidation, Platinum, Rhodium, Platinum alloys, High-temperature research, Palladium, Gold, Rhenium, Refractory metal alloys, Aluminum, Boron compounds, Nitrides, Ductility.

Air flow versus weight loss rate data on pure platinum has been extended to an air flow rate of 960 ipm at 2550 F. Increases in flow rate are seen to have a diminishing effect on weight loss rates at higher and higher flow rates. Diffusion studies were performed on platinum-2.5% palladium alloy clad FS-85 and TZM at 2550 F. The diffusion appeared to be transgranular and very rapid for both the TZM and the FS-85 base samples. It is expected that these studies will be extended to include platinum and platinum-10% rhodium alloy coatings during the next report period. Layers of gold, rhenium, aluminum, and boron nitride were deposited on refractory base metal for diffusion barrier studies. Evaluations of the samples containing aluminum and boron nitride have initially indicated that these materials will not be useful for diffusion barriers. (Author)

AD-601 780 Div. 17
OTS Price $5.00

General Electric Co., Cincinnati, Ohio.
THE STRUCTURAL STABILITY OF WELDS IN COLUMBIUM ALLOYS.
Quarterly progress rept. no. 3, 1 Nov 63-1 Feb 64.
by R. E. Yount. 10 Feb 64, 58p
NP 13816

Unclassified report

Descriptors: (*Refractory metal alloys, Welds), (*Niobium alloys, Welds), (*Welds, Aging (Materials)), Grain structures (Metallurgy), Stability, Impurities, Cooling, Ductility, Transition temperature, Hardness, Loading (Mechanics), Tungsten alloys, Molybdenum alloys, Vanadium alloys, Zirconium alloys.

.Aging studies of the three weld conditions were essentially completed and the aging kinetics compared. The B-66 .125 inch thick sheet was received and the evaluation of the effect of thickness initiated. Several conclusions have developed. (1) Interdendritic spacings of the weld metal are more strongly influenced by power input and cooling rate during welding than by chemical composition. (2) As-welded bend transition is dependent on welding speed. The faster the speed the lower the bend transition temperature for the condition studied. (3) The kinetics of aging in the temperature range of 1600 - 2200F is strongly influenced by interdendritic spacing, hence by weld parameters. The larger the interdendritic spacing the more sluggish the aging reaction. (4) A double aging reaction has been found in the B-66 alloy, one which occurs in the weld zone and a second which involves the heat affected zone. (Author)

AD-601 821 Div. 17, 26
OTS Price $0.50

Army Materials Research Agency, Watertown, Mass.
COMPARISON OF VARIOUS TEST SPECIMENS FOR THE DETERMINATION OF NOTCH SENSITIVITY AND FRACTURE TOUGHNESS OF HIGH-STRENGTH SHEET MATERIALS.
Technical rept.,
by Charles F. Hickey, Jr. and Frank R. Larson. Feb 64, 20p
Proj. 1A024401A111
AMRA TR64 04

Unclassified report

Descriptors: (*Test methods, Heat resistant metals and alloys), (*Heat resistant metals and alloys, Sheets), Test methods, Fracture (mechanics), Toughness, Steel, Molybdenum alloys, Titanium alloys, Spacecraft, Low temperature research, Aluminum alloys, Nickel alloys, Chromium alloys, Vanadium alloys, Stainless steel.

A variety of test specimens and test methods are currently being used by several investigators to evaluate materials for space applications. In general, these tests are being conducted on high-strength sheet materials using specimens containing notches of one sort or another. The purpose of this program was to compare various test specimens for the determination of notch sensitivity and fracture toughness. Specimens considered were: (1) 1-inch-wide edge-notched, (2) 1.5-inch-wide center-notched, and (3) 3-inch-wide center-notched. Notch sensitivity data were obtained from all specimens; fracture-toughness data, based upon the ink stain and percent shear method, were gathered primarily from the 3-inch-wide specimen. Materials considered include AMS 6434, H11, 300M, and PH 15-7 molybdenum steels and 6A1-4V titanium. Two or more strength levels per alloy were investigated and testing temperatures ranged from +165 to -80F. Results of this investigation indicate that, of the designs considered, the 3-inch-wide specimen generally offers the best test to measure notch sensitivity or fracture toughness. (Author)

AD-601 823 Div. 17, 26
OTS Price $2.75

Defense Metals Information Center, Columbus, Ohio.
VACUUM DEGASSING IN THE PRODUCTION OF PREMIUM-QUALITY STEELS.
by P. J. O'Reilly. 11 Mar 64, 125p DMIC 200
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Steel, Degasification), Industrial production, Mechanical properties, Controlled atmospheres, Vacuum apparatus, Melting, Electric furnaces, Refining (Metallurgy), Fatigue (Mechanics), Alloys.

Descriptors: (*Prosthetics, Plastics), (*Plastics, Degradation), (*Polymers, Metabolism), Biochemistry, Enzymes, Hydrolases, Oxidoreductases, Free radicals, Environment, Molecular structure, Mechanical properties, Reviews.

It is the object of the article to review the specific hydrolytic, redox, and electron transfer reactions involving enzymes and their mechanisms. The stability of the synthetic high polymers in the biochemical environments is much higher than that of proteins in general, but the increasing use of these materials in the field of surgical implants and internal prostheses has necessitated the systematic long range study of the systems in these surroundings. The study of the correlation of the mechanical strength and the chemical structures of these polymers tested as implants in living animals is reviewed, and the suitability of several synthetic polymers for this application is discussed. (Author)

AD-602 262 Div. 16
OTS Price $0.50

Madigan Army Hospital, Tacoma, Wash.
ANNUAL PROGRESS REPORT. CLINICAL INVESTIGATIONS.
Rept. for 1 Jul 63-30 Jun 64,
by Henry W. Boyce, Jr., James G. Billingsley, Stanley Newman and Bohn D. Allen. 30 Jun 64, 10p
Unclassified report

Descriptors: (*Pathology, Abstracts), Pregnancy, Diagnostic agents, Hormones, Infectious diseases, Neoplasms, Wounds and injuries Bibliographies.

Summaries are presented on the clinical investigation of (1) Gastroesophageal pH and pressure gradients during pregnancy and their association with reflux esophagitis and hiatal hernia, (2) Evaluation of patients with pulmonary sarcoid, utilizing pulmonary function methods in an attempt to create simplification of present methods, (3) Hormone-induced diseases: A review of the world literature, (4) A clinical and endoscopic study of the incidence, pathological anatomy, and pathophysiology of abdominal sarcoidosis, and (5) The effect of faraday induced current upon wound healing.

AD-602 283 Div. 16
OTS Price $1.25

Naval Training Device Center, Port Washington, N. Y.
JAMES J. GIBSON ON VISUAL PERCEPTION: ANALYSIS OF SELECTED PAPERS,
by Milton W. Horowitz. Feb 64, 48p
Contract N61339 294
NAVTRADEVCEN 294 5
Unclassified report

Descriptors: (*Visual perception, Theory), (*Pilots, Visual perception), Scientific research, Scientific personnel, Analysis, Psychology, Bibliographies, Documentation, Vision, Sensory perception, Flight simulators, Visual signals, Helicopters, Space perception.

This report presents a critical analysis of James J. Gibson's theory of visual perception and orientation in space. The more important papers of Gibson, his colleagues and critics, are discussed in relation to perceptual theory and the pilot's visual world. The report also includes an heretofore unpublished application of Gibson's theory to an important problem in training device design: J. J. Gibson and O. W. Smith, 'Sensory Cues and Dyanmic Distortion in a Helicopter Flight Simulator.' (Author)

AD-602 298 Div. 16
OTS Price $1.10

Philco Research Labs., Newport Beach, Calif.
APPLICABILITY OF OLFACTORY TRANSDUCERS TO THE DETECTION OF HUMAN BEINGS.
Quarterly status rept. no. 3, 1 Apr-30 Jun 64,
by H. A. Ells. 30 Jun 64, 6p
Contract N600 61444
Unclassified report

Rept. is part of Proj. AGILE, sponsored by ARPA.

Descriptors: (*Smell, Electronic recording systems), Sensory perception, Thresholds (Physiology), Stimulation, Oscilloscopes, Odors, Electrodes, Cathode followers, Transducers, Detection, Voltage, Micrometers, Muscidae.

Work on the program was directed primarily toward (1) further characterization of the electrical responses to olfactory stimulation and perfection of recording methods, (2) attempts to elucidate the effect of several biological and experimental variables on olfaction and (3) exploration of the olfactory spectrum of the antennal pits as indicated by electrical responses to compounds belonging to a number of classes. A new technique was developed for the instrumentation of the fly's olfactory organ, simplifying the former procedure and making it possible for an individual to become proficient in instrumenting a fly in a short time.

Objectives: (1) To study the stress-corrosion characteristics of 18% nickel maraging steel with respect to compositional variation. (2) To study the effect of environmental temperature on the rate of stress-corrosion cracking in three alloys: 18% nickel maraging steel, a low-alloy martensitic steel, and a hot-worked die steel. (3) To study the electropotential changes occurring in 18%-nickel maraging steel during stress-corrosion exposure, and the effect of applied potential. (Author)

AD-602 052 Div. 17, 26
OTS Price $2.60

Watervliet Arsenal, N. Y.
A STUDY OF THE WELD HEAT-AFFECTED ZONE OF CENTRIFUGALLY CAST FIVE PERCENT CHROMIUM STEEL.
Technical rept.,
by Keh Chang Wu. Dec 63, 28p
WVT ID6316

Unclassified report

Descriptors: (*Steel, Welding), (*Welding, Steel), Chromium alloys, Centrifugal casting, Castings, Ductility, Microstructure, Fracture (Mechanics), Phase studies, X-ray diffraction analysis, Austenite, Martensite, Heat treatment, Toughness, Hardness.

The weldability of centrifugally cast 5% chromium steel was investigated by using a hot ductility and synthetic heat-affected zone technique. Ductility of the specimen was greatly reduced above 2400F for the on-heating test. However, after heating to a detrimental temperature of 2500F and cooling to 2400F, ductility almost recovered its original value. Therefore, hot-cracking is not considered likely. The microstructure in the heat-affected zone at various locations was reproduced in Charpy impact test specimens which were later tested at various temperatures ranging from -60 to +212F. The result showed that a specimen thermally cycled at an 1800F peak temperature gave the lowest impact strength. X-ray diffraction and electron micrography revealed the existence of retained austenite which decomposed during tempering treatment. It is believed that the retained austenite is responsible for the lowering of impact strength in the specimens which experienced an 1800F peak thermal cycle. (Author)

AD-602 061 Div. 17
OTS Price $0.50

Redstone Scientific Information Center,
Redstone Arsenal, Ala.
TRANSITION FROM PLASTIC TO BRITTLE BEHAVIOR IN THIN TUNGSTEN WIRES.
by W. Schilling and H. Paschedag. 10 Jun 64, 12p
RSIC 188; TT 64 11816

Unclassified report

Trans. of das Metall (West Germany) 1960, v. 14, no. 1, p. 23-25.

Descriptors: (*Tungsten, Wires), Mechanical properties, Phase studies, Transition temperature, Plasticity, Brittleness, Test equipment, Test methods, Metallography, West Germany, Ductility, Wire, Filaments, Grain structures (Metallurgy).

A method for testing the behavior of thin tungsten wires at bending deformation is described. All tungsten wires show, within a narrow temperature range, the transition from brittle to ductile behavior. For wires with a fiber texture this transition temperature T sub e is below zeroC; for recrystallized wires, at 150-400C. Long-crystalline wires have a lower T sub e than the short-crystalline ones. The position T sub e is determined by the form of the fracture (transcrystalline resp. intercrystalline). (Author)

AD-602 075 Div. 17
OTS Price $1.00

David Taylor Model Basin, Washington, D. C.
FACTORS INFLUENCING THE FATIGUE LIFE OF AN HY-80 COMPOSITION STEEL FULLY QUENCHED AND TEMPERED TO VARIOUS STRENGTH LEVELS.
Progress rept.,
by A. R. Willner and M. L. Salive. Jun 64, 31p
Proj. S F013 03 02, Task 2018
DTMB 1807

Unclassified report

Descriptors: (*Steel, Fatigue (Mechanics)), Tensile properties, Life expectancy, Austenite, Grain structures (Metallurgy), Quenching (Cooling), Heat treatment.

The report evaluates the effects of strength level, Charpy V-notch energy, prestraining, prestraining and stress relieving, and austenitizing temperature on the fatigue life of a fully quenched HY-80 steel composition. The fatigue data developed indicate that the designer would have to be cautious when going to higher strength steel when using a safety factor which is considered satisfactory for lower strength steels, i.e., if higher strength steels are to be used, larger safety factors are necessary to obtain a comparable fatigue life. The limited data presented on experimental HY-150 steels indicate that caution will have to be exercised in evaluating large-specimen fatigue data. (Author)

AD-602 081 Div. 17, 25
OTS Price $1.75

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF THE RELATIONSHIP OF TWINNING TO BRITTLE FRACTURE OF REFRACTORY METALS.
Rept. for 1 Jan 63-15 Feb 64
by C. N. Reid, A. Gilbert and G. T. Hahn. May 64, 63p
Contract AF33 657 7376, Proj. 7351, Task 735101
ASD TDR63 360 P2

Unclassified report

Descriptors: (*Refractory metals, Fracture (Mechanics)), (*Molybdenum, Brittleness), (*Crystal structure, Fracture (Mechanics)), Metallic crystals, Single crystals, Crystal lattice defects, Crystal growth, Failure (Mechanics), Stresses, Strain (Mechanics), Silicon, Iron.

Tension, compression, and bend tests were used to investigate brittle fracture in both single-crystal and polycrystalline molybdenum samples of three contrasting compositions. Although in compression, twins were observed frequently to be responsible for transcrystalline and intercrystalline crack nucleation, during tension or bend tests, no failures were observed whose initiation could be ascribed to twinning. Even in single crystals stressed along (001), the fractures were not twin-induced. It is concluded that twins are just one of several heterogeneities competing in the formation of cracks and that in the material examined other heterogeneities were always dominant. Experiments were conducted on Mo-35Re in which the strain was recorded as a function of time during the formation of twinning bursts. The results indicate that twinning in this situation is essentially a sonic phenomenon. Dislocation arrangements were revealed in Fe-3Si by etch-pitting, and it was observed that the propensity for twinning under given conditions was identical in both the presence and absence of a strongly polygonized substructure. (Author)

This report gives the experiences of several steel producers and consumers with vacuum degassing as a melting practice in the manufacture of high-strength steels for critical applications. The parameters involved in determining the effects of melting practice on mechanical properties are outlined. Pertinent melting processes are described and evaluated qualitatively. In presenting the data, vacuum degassing is compared with other melting practices such as conventional air melting and consumable-electrode vacuum-arc remelting (CEVAR). Generally, there is a trend indicating that vacuum degassing is being used in some production applications instead of air-melted or CEVAR material. In terms of higher and more uniform transverse tensile properties and impact strength, longer fatigue life, and improved cleanliness, the CEVAR alloys were the best. Vacuum degassing by any of the various methods resulted in an improvement in properties of air-melted alloys. In some instances it appeared that the quality of CEVAR alloys could be approached when stream degassing or D-H (Dortmund-Horder) treatment was applied to air melts. Recommendations are given for additional investigations on the effects of melting practice on mechanical properties of premium-quality steels. (Author)

AD-601 825 Div. 17
OTS Price $1.00

Titanium Metals Corp. of America, New York.
DEVELOPMENT OF A STABLE-BETA TITANIUM ALLOY.
Quarterly rept. no. 6, 1 Oct-31 Dec 63
by D. B. Hunter. 31 Dec 63, 36p
Contract DA30 069ORD3743, Proj. 59332008
WAL TR405 2 5.

Unclassified report

Descriptors: (*Titanium alloys, Dispersion hardening), (*Dispersion hardening, Titanium alloys), Aging (Materials), Vanadium alloys, Chromium alloys, Aluminum alloys, Molybdenum alloys, Iron alloys, Copper alloys, Nickel alloys, Rolling (Metallurgy), Eutectics, Quenching (Cooling), Tensile properties, Ductility, Cold working, Hot working, Phase studies, Microstructure.

An attempt to induce compound precipitation hardening in Ti-17V-10Cr-3Al, Ti-8Mo-8V-7.5Fe-3Al, Ti-8Mo-8V-7.5Fe-3Al-1Co and Ti-15Mo-5Fe-3Al alloys by cold reduction and subsequent aging resulted in hardening by alpha precipitation instead. Similar work on Ti-17V-8Cr-3Al-3Ni indicated that this alpha hardening was induced by either hot or cold rolling and suppressed by solution treatment. Solution treating, quenching and aging Ti-17V-10Cr-3Al, containing 0.5 and 1% Si, at 1250F resulted in rapid hardness increases of up to 100 Vickers points without any clear accompanying microstructural change; slow cooling suppressed this aging response. Aging responses were determined for the metastable alloys Ti-17V(1.5 to 4)Fe-3Al and Ti-8Mo-8V-(1 to 3) Fe-3Al, over a range of times and temperatures. A statistical correlation between Vickers hardness and ultimate tensile strength on stable-beta alloys indicated that 25 Vickers points corresponded to about 10,000 psi. Two metastable and two stable-beta alloys were selected for further evaluation as larger ingots: metastable Ti-17V-4Fe-3Al and Ti-8Mo-8V-2Fe-3Al, and stable-beta Ti-17V-10Mn-3Al and Ti-8Mo-8V-6Fe-3Al, respectively. (Author)

AD-601 861 Div. 17, 4, 14, 25
OTS Price $1.00

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
VAPOR DEPOSITED BORIDES OF GROUP IVA METALS.
Technical Information series,
by J. J. Gebhardt and R. F. Cree. Jun 64, 31p R64SD46
Contract AF04 694 222

Unclassified report

Descriptors: (*Borides, Vapor plating), (*Refractory metals, Borides), (*Group IV elements, Electrodeposition), Titanium compounds, Zirconium compounds, Borohydrides, Grain structures (Metallurgy), Boron, Hafnium compounds, Boron compounds, Heat-resistant metals and alloys.

The formation of vapor deposited TiB2, ZrB2 and HfB2 at 1400C was studied with respect to the influence of process variables on structure and stoichiometry. Stoichiometric, non-porous deposits of TiB2 were obtained; ZrB2 and HfB2 deposits contained beta rhombohedral boron. Precision lattice parameters were determined for all three diborides. The effect of co-deposited boron on these parameters appears to be slight. A small degree of preferred orientation existed in materials made under these conditions which indicates that crystallites tend to be deposited with c axes parallel to the substrate. Grain size, orientation, porosity and stoichiometry are all influenced and therefore should be controllable by process variation. (Author)

AD-601 977 Div. 17
OTS Price $0.75

Materials Research Corp., Orangeburg, N. Y.
IMPURITY ATOM-DISLOCATION INTERACTIONS AND SUBSEQUENT EFFECTS ON MECHANICAL PROPERTIES OF REFRACTORY METALS.
Final rept. for 1 Nov 61-31 Nov 62
by H. R. Nesor and G. T. Murray. Mar 63, 29p
Contract AF33 657 7687, Proj. 7351, Task 735101
ASD TDR63 238, N63 18079

Unclassified report

Descriptors: (*Molybdenum, Single crystals), (*Single crystals, Molybdenum), (*Creep, Refractory metals), Tantalum alloys, Carbon, Tensile properties, Strain (Mechanics), Aging (Materials), Heat of activation, Atoms, Heat treatment, Electron beams, Refining (Metallurgy), Crystal structure.

The interaction between dislocations and impurity atoms in electron beam refined arc-cast molybdenum single crystals was studied in the form of strain aging and tensile creep experiments. Data was obtained on the kinetics of the return of the yield drop process for molybdenum containing carbon in the temperature range from 475-650C. This data yielded an activation energy of 21,400 cal/mol for the process. A comparison is made of this with other published values. A Mo-1%Ta alloy was also examined but strain aging effects were not observed. The tensile creep behavior of molybdenum containing carbon was compared with that for purity material. The presence of carbon greatly increased the creep resistance while a polygonization treatment slightly decreased the creep resistance. The tendency for substructure to coarsen was found to be less in molybdenum containing carbon than in high purity material. (Author)

AD-602 023 Div. 17
OTS Price $0.50

Aerojet-General Corp., Azusa, Calif.
THE INVESTIGATION OF STRESS CORROSION CRACKING OF HIGH STRENGTH STEELS.
Informal monthly progress rept. no. 32 for May 64,
by R. B. Setterlund. 2 Jul 64, 6p, AGC L0414 02 8
Contract DA04 495ORD3069

Unclassified report

Descriptors: (*Maraging steels, Corrosion), (*Corrosion, Steels), (*Steels, Corrosion), Nickel alloys, Chemical analysis, Martensite, Temperature, Titanium alloys, Dies, Failure (Mechanics), Environmental tests, Voltage, Stresses.

The work consisted of cathodic protection studies, anodic polarization measurements, and an evaluation of the stress corrosion performance of the various samples of 2024 and 7075 alloy plate that were prepared to reflect a range of susceptibility to stress corrosion. A metallographic examination of these samples with the electron microscope using the thin foil transmission technique and with the light microscope is described and finally, the measurement of magnetic susceptibility and electrical conductivity is discussed.

AD-602 123 Div. 17
OTS Price $1.60

IIT Research Inst., Chicago, Ill.
VANADIUM ALLOY STUDIES.
Bimonthly rept. no. 2, 1 Apr-31 May 64.
by D. Weinstein and F. C. Holtz. 1 Jul 64, 13p
IITRI B6021-2
Contract NOw64 0239c

Unclassified report

Descriptors: (*Vanadium alloys, Creep), Refractory metal alloys, Niobium alloys, Tantalum alloys, Titanium alloys, Dispersion hardening.

Vanadium development studies were conducted toward the primary objective of producing significantly improved short-time (minutes to a few hours) creep properties at temperatures between 2000F and 2400F. It was determined that tantalum additions to a V-Cb-Ti base composition result in a significant improvement in creep properties. However, further improvement, without sacrifice of fabricability and other properties, is necessary for utilization of this material at 2200F to 2400F. Various approaches relying upon production of a stable dispersant at 2200 - 2400F are being employed to accomplish this objective. (Author)

AD-602 129 Div. 17, 14
OTS Price $3.50

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
ADVANCEMENT OF HIGH TEMPERATURE PROTECTIVE COATINGS FOR COLUMBIUM ALLOYS (II).
Rept. for 1 Mar 63-1 Mar 64,
by D. B. Warmuth, J. D. Gadd, and R. A. Jefferys.
Apr 64, 209p
Contract AF33 657 7396, Proj. 7312, Task 731201
ASD TDR62 934 P2

Unclassified report

Descriptors: (*Niobium alloys, Refractory coatings), (*Refractory coatings, Corrosion inhibition), Chromium alloys, Titanium alloys, Silicon alloys, Optimization, Reliability, Powder alloys, Vapor plating, Low-pressure research, High-temperature research, Refractory metal alloys, Oxidation, Coatings.

The objective of the program was (a) to advance and optimize the Cr-Ti-Si coating process for laboratory scale and pilot scale coating furnaces, (b) to determine the protective reliability of the Cr-Ti-Si coating, and (c) to investigate the effects of elevated temperature-reduced pressure (air) exposure upon the protective characteristics of the Cr-Ti-Si coating. (Author)

AD-602 131 Div. 17
OTS Price $0.75

Navy Electronics Lab., San Diego, Calif.
EFFECTS OF HEAT TREATMENTS ON CAST GOLD ALLOY. PREHEATED FURNACE OR SALT BATH AT 450 DEGREES F PRODUCES OPTIMUM HARDNESS AND STRUCTURAL UNIFORMITY,
by J. C. Thompson. 3 Mar 64, 25p
NEL 1211

Unclassified report

Descriptors: (*Heat treatment, Gold alloys), (*Gold alloys, Heat treatment), Castings, Metallurgy, Hardness, Structural properties, Microstructure, Metallography, Photomicrography, Quenching (Cooling), Palladium alloys, Silver alloys, Copper alloys, Zinc alloys.

Specimens of cast gold alloy were subjected to various methods of heat treatment, to determine the effects upon microstructure and hardness. Hardness of the heat-treated specimens was determined with a Tukon tester, using a Knoop indenter. Variations in microstructure were studied by metallographic and photomicrographic examinations. Measurements were made of the temperature generated during grinding and polishing of cast gold. (Author)

AD-602 132 Div. 17, 14
OTS Price $1.25

Watervliet Arsenal, N. Y.
CANDIDATE MATERIALS FOR WHISKERS COMPOSITES.
Technical rept.
by Michael J. Salkind. May 64, 43p
Proj. 1A0 24401A11006
WVT RR-6411

Unclassified report

Descriptors: (*Fiber metallurgy, Composite materials), (*Single crystals, Fiber metallurgy), Beryllium compounds, Mechanical properties, Thermal expansion, Carbon, Boron compounds, Carbides, Beryllium, Silicon compounds, Oxides, Aluminum compounds, Bonding, Titanium, Chromium, Zirconium, Iron, Nickel, Cobalt, Fibers.

An analysis was made of candidate materials for whisker composites. The expected strength-to-weight ratio of composites of nineteen matrix materials with fourteen different fiber materials as a function of fiber content was calculated. The availability, bondability, and thermal expansion properties of candidate materials are discussed. (Author)

AD-602 138 Div. 17
OTS Price $1.50

Technical Univ. of Norway, Trondheim.
SPATIAL DISTRIBUTION OF MANGANESE, SILICON, CHROMIUM AND OXYGEN IN SUBMERGED-ARC WELD DEPOSITS.
Final technical rept. for 1 Jan 63-31 Mar 64.
by N. Christensen. 31 Mar 64, 51p
Contract DA91 591EUC2797, continuation of
Contract DA91 591EUC2043

Unclassified report

Descriptors: (*Arc welding, Slags), (*Arc welds, Metallurgical analysis), Welding fluxes, Metallography, Metals, Manganese, Chroium, Silicon, Oxygen, Nitrogen, High-temperature research, Iron compounds, Chemical analysis, Equations, Measurement, Distribution, Norway.

Submerged-arc deposits prepared under acid types of fluxes were examined with regard to their content of silicon, manganese, oxygen and nitrogen. It was found that silicon and oxygen are transferred from the slag to the metal, the amounts picked up depending on the welding conditions. The final concentrations of Si and O are related to the contents of FeO and SiO2 in the slag in a manner corresponding to chemical equilibrium at temperatures between 1850 and 2050C. In the tested combination of unalloyed flux and a wire containing 2% Mn this element was transferred to the slag. This reaction did not proceed to the state of pseudo-equilibrium as those involving silicon and oxygen. Incompleteness of reaction in the high-temperature stage was believed to be mainly responsible for lowered manganese contents in a zone 0.5 to 1.5 mm from the bead surface. A similar gradient of opposite sign was observed when chromium

Division 17 - METALLURGY

AD-602 083 Div. 17
OTS Price $2.75

Aluminum Co. of America, New Kensington, Pa.
MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY PLATE.
Rept. for Mar 62-Apr 64
by G. W. Stickley and D. J. Brownhill. May 64, 134p
Contract AF33 657 7837, Proj. 7381, Task 738103
ML TDR64 105

Unclassified report

Descriptors: (*Aluminum alloys, Mechanical properties), (*Metal plates, Shear stresses), Tensile properties, Compressive properties, Thickness, Heat treatment, Loading (Mechanics), Elasticity, Strain (Mechanics), Aging (Materials).

Ratios of tensile, compressive, shear and bearing properties to corresponding long-transverse tensile properties were computed. Some variations in ratios occur with respect to alloy, temper, thickness, location in thickness, and direction of loading. Groups of ratios for each alloy in the -TX51 tempers were analyzed statistically. Minimum-average values were determined. Using these minimum-average values, together with long-transverse tensile properties from specifications as basis A values and corresponding basis B values obtained from recent production data, tables of design mechanical properties of MIL-HDBK-5 were prepared. Tensile and compressive stress-strain characteristics were determined. Typical and minimum stress-strain and compressive tangent-modulus curves were prepared for MIL-HDBK-5. (Author)

AD-602 101 Div. 17, 26
OTS Price $1.00

Marine Engineering Lab., Annapolis, Md.
RESTRAINT CRACKING TECHNIQUE FOR USE IN SIMULATED WELD THERMAL CYCLING STUDIES.
Research and development rept.,
by W. G. Schreitz. 26 Jun 64, 33p
MEL-A 87 117

Unclassified report

Descriptors: (*Welds, Brittleness), (*Steel, Welding), (*Test methods, Welds), Simulation, Sulfur, Rare earths, Ultrasonic radiation, Non-destructive testing, Temperature, Monitors, Thermal stresses, Microstructure, Fracture (Mechanics).

Weld hot-cracking tendencies of five experimental HY-80 steels were studied with the time-temperature cycling apparatus developed at Rensselaer Polytechnic Institute. Restraint was introduced by restricting the longitudinal expansion and contraction of 0.25-in. diameter test specimens subjected to thermal cycles corresponding to various welding conditions. The restrained specimens were monitored during cycling by an ultrasonic flaw detector to record the temperature of crack initiation. Cracking was detected during only the cooling portion of the thermal cycles and generally within the temperature range of 2400 to 2000F. Crack initiation appeared to be controlled by both the degree of restraint and the peak temperature. Cracking tendencies of the steels were related to sulphur content by this technique.

AD-602 103 Div. 17, 25, 4
OTS Price $1.25

Experimental Inst. of Light Metals, Milan (Italy).
RESISTOMETRIC INVESTIGATION OF PRE-PRECIPITATION IN THE Al-mg 5% ALLOY.
Final rept. for 1 Jan-31 Dec 63.,
by T. Federighi and S. Ceresara. 28 Jan 64, 43p
EILM 13 177 6401 104
Contract DA91 591EUC2767

Unclassified report

Descriptors: (*Magnesium alloys, Aging (Materials), (*Aluminum alloys, Aging (Materials), Quenching (Cooling), Heat treatment, Crystal lattice defects, Resistance (Electrical), Nitrogen, Liquefied gases, Italy, Diffusion, Chemical precipitation.

The pre-precipitation process in the supersaturated Al-5.1% at.% Mg alloy has been extensively investigated by means of electrical resistivity measurements performed at liquid nitrogen temperature (-195C). As known, where as the process cannot be discovered in Al-mg alloys by the usual X-ray low angle method it is possible to detect it by resistivity measurements, since during the beginning of the process resistivity undergoes an increase which can be easily separated from other recovery processes.

AD-602 114 Div. 17, 25
OTS Price $2.60

Martin Marietta Corp., Orlando, Fla.
MEASUREMENT OF RESIDUAL STRESS BY X-RAY DIFFRACTION.
Technical rept. no. 7
by A. L. Esquivel and H. M. Otte. Jun 64, 27p OA 2067
Contract Nonr3706 00

Unclassified report

Paper presented at Southern Metals/Materials Conference, 16-17 Apr 64; to appear in Materials Science Research, v. 2.

Descriptors: (*Stresses, X-ray diffraction analysis), (*X-ray diffraction analysis, Stresses), Non-destructive testing, Silicon alloys, Bronze, Copper alloys, Zinc alloys, Crystal lattice defects, Deformation, Tensile properties, Strain (Mechanics), Mathematical analysis, Brass, Metals.

For the measurement of residual stresses, x-ray diffraction is potentially the best nondestructive method available. Experiments are described in which silicon bronze and alpha brass samples were examined by x-rays while subjected to tensile deformation. The positions of the diffraction lines and their breadths were measured and analyzed. The special features of the experimental arrangement employed are presented and the method of analysis explained. An important result of this study is the observation that the stress-strain curve obtained from the x-ray diffraction measurements follows the stress-strain curve obtained from a standard tensile test, contrary to what many previous investigators have reported with different experimental techniques. Furthermore, for materials which may form stacking faults upon deformation, the x-ray data must first be corrected for the effects produced from stacking faults before the stress is calculated. (Author)

AD-602 120 Div. 17, 25, 4
OTS Price $1.25

Aluminum Co., of America, New Kensington, Pa.
INVESTIGATION OF THE MECHANISM OF STRESS CORROSION OF ALUMINUM ALLOYS.
Quarterly rept. no. 2, 1 Mar-31 May 64
by G. C. English and William King 6 Jul 64, 45p
Contract NOw64 0170c

Unclassified report

Descriptors: (*Aluminum alloys, Corrosion), (*Metal plates, Magnetic properties), Cathodic protection, Stresses, Metallography, Electron microscopes, Liquid immersion tests, Corrosive liquids, Heat treatment, Quenching (Cooling).

Descriptors: (*Refractory metals, High-temperature research), (*Pyrometers, Refractory metals), Mechanical properties, Electron beams, Optical instruments, Laboratory furnaces, Blackbody radiation, Coatings, Glass, Brightness, Surface properties, Tensile properties, Compressive properties, Fatigue (Mechanics), Correlation techniques, Calibration, Test methods.

A procedure for temperature measurement and control in an electron beam furnace was established by using the optical and two-color pyrometers. The emissivity of the specimen and attenuation by the furnace sight-port glass and metallic vapor coatings introduced errors in the readings made by both instruments. These errors in two-color readings were considerably less than those in readings made with the optical pyrometer. To permit the determination of the true temperature of a test specimen, and empirical correlation was made between the temperature of a blackbody hole and the brightness of a surface simulating that of a test specimen. The accuracy of this correlation is discussed with respect to the quality of the blackbody holes, the errors in sight-port glass corrections, instrument calibration, and the accumulated statistical uncertainties of pyrometer readings. (Author)

AD-602 299 Div. 17, 14
OTS Price $1.25

Alloyd General Corp., Cambridge, Mass.
EFFECT OF FLUID ENVIRONMENT ON TORSIONAL FATIGUE FAILURE.
Progress rept. no. 1, 1 Mar-31 May 64,
by M. J. Hordon and P. F. Weihrauch. 16 Jun 64, 46p
Alloyd 64GRX10
Contract NOw64 0248f

Unclassified report

Descriptors: (*Steel, Failure (Mechanics)), (*Fatigue (Mechanics), Environmental tests), Lubricants, Viscosity, Loading (Mechanics), Strain (Mechanics), Stresses, Plasticity, Heat treatment, Hardness, Phase studies, Microstructure, Life expectancy, Surfaces, Mineral oils, Chemical analysis, Torque, Liquids.

A study of the interaction of the relevant parameters leading to fatigue failure under conditions of torsional loading was initiated. An experimental program aimed at studying the effects of strain amplitude, microstructure, lubricant chemistry and lubricant viscosity on the initiation of fatigue cracks and their subsequent growth to failure was developed. Experimental techniques were developed to monitor both the surface and internal damage accompanying the fatigue process as well as the changes in work hardening behavior during fatigue. The results of testing bearing grade 52100 steel in two fluid environments are presented. (Author)

was being transferred to the metal phase from an alloyed flux. It was concluded that the amount of matter transferred across the metal/slag phase boundary was the main controlling factor both with regard to the concentrations established in the high-temperature stage and in the subsequent formation of concentration gradients at the metal/slag interface. (Author)

AD-602 157 Div. 17
OTS Price $1.60

IIT Research Inst., Chicago, Ill.
FIBER-REINFORCED METALS AND ALLOYS.
Bimonthly rept. no. 3, 8 Mar-8 May 64.
8 Jun 64, 17p IITRI B6020 3
Contract NOw64 0066c

Unclassified report

Descriptors: (*Fiber metallurgy, Composite materials), (*Composite materials, Fiber metallurgy), Steel, Silver, Fracture (Mechanics), Alloys, Deformation, Ductility, Brittleness, Tensile properties, Mechanical properties, Heat treatment, Pressure, Reinforcing materials Fibers, Microstructure.

The basic objective of the program is to investigate the fundamental factors affecting the fiber reinforcement of metals and alloys. The ultimate objective is to develop new materials possessing high strength-to-weight ratios. The effort on this program is divided into two parts-- one part devoted to the study of fundamental factors affecting the fiber reinforcement of metals, and the other part devoted to the development of new fibers with high strength and high modulus. The majority of the effort is concentrated upon the first part.

AD-602 158 Div. 17
OTS Price $1.00

Syracuse Univ., N. Y.
THE EFFECT OF TESTING SYSTEM STIFFNESS ON FRACTURE.
Rept. for 1 Apr 63-31 Mar 64,
by V. Weiss, K. S. Grewal, and J. Sessler. Apr 64, 35p
Contract AF33 657 11154, Proj. 7350, Task 735003
ML TDR64 150

Unclassified report

Descriptors: (*Fracture (Mechanics), Test methods), (*Test methods, Fracture (Mechanics)), Geometry, Test equipment, Aluminum alloys, Stresses, Physical properties, Metallurgy, Deformation, Titanium alloy, Thickness, Brittleness, Design.

A preliminary study of the influence of testing system stiffness on the fracture of center-cracked sheet specimens of 7075-T6 aluminum indicated a noticeable effect of testing system stiffness on crack propagation in that decreasing the testing system stiffness resulted in the suppression of the slow or intermittent crack growth. A controlled experimental program on titanium RS 140 to study the interplay between specimen length and crack length, the two variables affecting the stiffness of the specimen, showed an effect of testing system stiffness on both crack propagation and fracture strength. Compliance curves, obtained with a specially designed compliance gage, showed a higher strain energy release rate for a given incremental crack growth dc in short specimens. The lower fracture strength observed in short specimens may be explained on this basis. Both energy and stress considerations of the effects of testing system stiffness are presented. An analysis of stiffness effects on crack propagation behavior is attempted. (Author)

AD-602 203 Div. 17, 14
OTS Price $1.00

Army Engineer Research and Development Labs., Fort Belvoir, Va.
LONG-TERM RUPTURE STRENGTH OF ALLOYS AND PLASTICS FROM TENSILE STRENGTH AT ELEVATED TEMPERATURES.
Technical rept.,
by S. Goldfein. 28 Apr 64, 34p
Task ID024401A11402
AERDL 1773TR

Unclassified report

Descriptors: (*Steel, Tensile properties), (*Rupture, steel), Plastics, High-temperature research, Iron alloys, Carbon, Mechanical properties, Tests, Alloys, Equations of state.

The report covers an investigation to determine if the long-term tensile stress-rupture strength of alloys could be calculated from the results of static tensile strength tests at elevated temperatures. Twenty-one alloys were investigated. A second-order form of a mechanical-chemical equation of state was used to draw master rupture curves from both long-term rupture and tensile strength data. It was concluded that the long-term strength of an alloy could be computed from a knowledge of its tensile strength at elevated temperatures, chemical composition, and mode of failure. (Author)

AD-602 288 Div. 17
OTS Price $2.25

Defense Metals Information Center, Columbus, Ohio.
CONTINUED OBSERVATIONS ON THE DISTRIBUTION OF STRESS IN THE VICINITY OF A CRACK IN THE CENTER OF A PLATE,
by L. R. Jackson. 14 Apr 64, 84p DMIC M190; DMIC M178, suppl.
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Metal plates, Fracture (Mechanics)), (*Fracture (Mechanics), Metal plates),(*Stresses, Distribution), Loading (Mechanics), Numerical analysis, Creep, Elasticity, Functions, Analytic geometry.

This memorandum supplements and augments information presented in DMIC Memorandum 178 (AD-422 463). In the present report, Neuber's stress equations are rewritten entirely in rectangular coordinates. In addition, numerical results have been extended to include the stress distribution around an indefinitely sharp crack. It is also shown that the stress function used in a British work for an indefinitely sharp crack yielded identical numerical results, even though the stress function was of a different type than that employed by Neuber. The Von Mises relation was chosen to delineate the area around a crack in which plastic flow is occurring. The numerical tables in this memorandum give values for the function of plane stress as well as one possible interpretation of plane strain. Values of the hydrostatic stress variant are also given for both plane stress and plane strain. (Author)

AD-602 292 Div. 17, 30
OTS Price $0.50

Naval Research Lab., Washington, D. C.
BRIGHTNESS AND TWO-COLOR PYROMETRY APPLIED TO THE ELECTRON BEAM FURNACE,
by H. Doering and P. Shahinian. 10 Jun 64, 18p
Proj. RR007 01 46 5407; ARPA Order 418 1
NRL 6062

Unclassified report

Soviet military outlays, the first detailed exposition of this kind. As such, the study may also contribute to the periodic discussion on budgetary disarmament.

AD-602 139 Div. 18
OTS Price $1.75

Stanford Research Inst., Menlo Park, Calif.
CIVIL DEFENSE IN THE UNITED KINGDOM.
Final rept.,
by Harvey Dixon and kendall Moll. Mar 64, 65p
Contract OCD OS63 184, Proj. IM4559
Unclassified report

Descriptors: (*Civil defense systems, Great Britain), Early warning systems, National defense, Recruiting, Training, Warfare, Civil defense personnel, Casualties, Mobilization, Armed forces operations, Logistics, Budgets, Costs, War potential, Research program administration, Civilian personnel.

This report analyzes British civil defense experience that may be helpful to the U.S. civil defense program. One notable aspect is British emphasis on recruiting and training of a large civil defense cadre, comprising about 1% of their total population. This type of force, essential to operational effectiveness in an emergency, has been built and maintained by various techniques applicable to the United States. Many other relevant doctrinal and policy aspects are also discussed. For example, because the British feel strategic warning of attack is likely, they are planning for possible evacuation from cities. Although they have not started a shelter program, the over-all level of their civil defense efforts is at least twice as great as that of U. S. efforts. (Author)

AD-602 154 Div. 18
OTS Price $3.00

Space Technology Labs., Inc., Redondo Beach, Calif.
OPERATIONS RESEARCH STUDY OF COMMAND AND CONTROL TRADE-OFFS IN AN AMPHIBIOUS ENV ENVIRONMENT.
Final rept.,
by Paul D. Chaiken. 31 Oct 63, 151p STL 8696 6003TU000
Contract Nonr3983 00
Unclassified report

Descriptors: (*Amphibious operations, Command and control systems), (*Command and control systems, Amphibious operations), (*Operations research, Armed forces operations), Lanchester equations, Mathematical models, Military strategy, Mobilization, Game theory, Search theory, Decision theory, Tactical warfare.

This study demonstrates the use of analytical techniques to quantitatively describe the interrelationships between mobility, dispersion, surveillance, and fire power as they affect the survival of tactical units on the battlefield. The purpose of such a study was to emphasize the possible use of analytical models to explore areas of Marine Corps/Navy advanced warfare military systems and operations in which outputs obtained from such analyses could lead, by implication, to recommendations for requirements for surveillance, fire power, force size, logistics, and command and control subsystems. The basic problem analyzed in this study can be summarized as follows: An amphibious landing force x, at sea, is to assault a limited area defended by a force y. The landing force x is to be split up into an air mobile force x sub a and a surface mobile force x sub s. The defending y, in turn, commits its forces by allocating part of y, beta sub 1 y, in defense of the beach and the remaining force, beta sub 2 y, to defend against the air mobile attack. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-601 813 Div. 18, 30
OTS Price $1.50

RAND Corp., Santa Monica, Calif.
SAMSOM: SUPPORT-AVAILABILITY MULTI-SYSTEM OPERATIONS MODEL.
by T. C. Smith. Jun 64, 56p RM-4077PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Mathematical models, Air force operations), (*Air force operations, Mathematical models), (*Monte Carlo method, Mathematical models), Operations research, Maintenance, Decision making, Aircraft, Scheduling, Programming (Computers), Simulation, Management engineering, Logistics.

The model has been designed to simulate the complex system of interacting operations and logistics support events found in Air Force organizations. The model accepts system and subsystem hardware design characteristics in terms of reliability and maintainability parameters. Inputs also include quantities of support resources (people, parts, equipment, and facilities), management policies governing availability and use of these resources, and maintenance inspection requirements. Given proper inputs, then, SAMSOM simulates a wide range of management policies, operations schedules, and related logistics support events and requirements. It can be used to examine such activity for extended periods of time for different weapon systems at several bases or locations (Author)

AD-601 935 Div. 18, 15
OTS Price $1.75

Northeastern Univ., Boston, Mass.
STUDIES IN METHODOLOGY FOR COMPLEX SYSTEMS.
Final rept., 15 Mar 63-14 Mar 64,
by Ladislav Dolansky, Alberto R. Galmarino, and Samuel M. Giveen. 14 Mar 64, 64p
Contract Nonr4106 01, Proj. NR276 006

Unclassified report

Report on Project NUMERICS

Descriptors: (*Operations research, Warfare), (*Warfare, Operations research), (*Lanchester equations, Mathematical models), (*Statistical processes, Queueing theory), Search theory, Armed forces operations.

The rapid defelopment of modern complex systems frequently leaves the necessary systems analysis methodology far behind. In an effort to develop the methodology, particularly as it applies to military systems, the following problems and topic areas were studied under Project NUMERICS: (1) a survey of the previous work of the Lanchester theory of combat revealed the present state of the art in this field and delineated a number of unsolved problems, (2) a study of continuous attrition processes, undertaken as a suitable stochastic approach to the analysis of battles between forces with homogeneous units, revealed that a zero-one law can be obtained for such processes; the results, under certain conditions, agree asymptotically with the corresponding results for the discrete analog. An investigation about diffusions satisfying the zero-one law, which holds for continuous attrition processes, yielded necessary and sufficient conditions in terms of their infinitesimal generators, (3) the problem of allocation of defense resources and effort was formulated in terms of search and queuing theories. (Author)

AD-601 974 Div. 18, 23, 28
OTS Price $0.75

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
DEVELOPMENT OF AN OPTIMUM COMPUTERIZED ALLOCATION SYSTEM.
by Robert F. Boldt. Apr 64, 28p
Proj. 2JO24701A723
APRO TRR1135

Unclassified report

Descriptors: (*Personnel management, Programming (Computers)), (*Army personnel, Management engineering), Warfare, Training, Aptitude tests, Systems engineering, Scheduling, Distribution, Performance (Human), Optimization, Military personnel, Operations research.

One objective of the FUTURE COMBAT Task, USAPRO is to develop a system of enlisted personnel allocation to maximize individual skills and preferences and at the same time meet Army staffing requirements. After determination that quality of manpower in the combat areas was perceptibly below that in the rest of the Army, computer based plans for allocating basic combat trainees to advanced training were developed and implemented experimentally on a trainee sample. The selection and testing of different allocation techniques, the mathematical bases for selected computerized systems, and results of comparison of three systems are reported. Two alternate plans, one of which takes into account individual training preference, proved more effective than the current procedure and were provided the Data Services and Administrative Systems Command. (Author)

AD-602 025 Div. 18
OTS Price $0.50

RAND Corp., Santa Monica, Calif.
SOME RECENT SIGNS OF REACTION AGAINST PREVAILING SOVIET DOCTRINAL EMPHASIS ON MISSILES.
by Thomas W. Wolfe. Jun 64, 12p P-2929

Unclassified report

Descriptors: (*Military strategy, Guided missiles) Warfare, Nuclear weapons, Strategic warfare, Weapons, Armament, Aircraft, Theory, USSR.

The Khrushchevian concept of the primacy of strategic missile forces as the main branch of Soviet military doctrine is contrasted with a recently developing counter-philosophy among certain Soviet military writers. Excerpts from the writings of the traditionalists suggesting that the unquestioned primacy of ballistic missiles could cripple the creative development of Soviet military theory are presented and discussed.

AD-602 072 Div. 18, 32
OTS Price $2.50

RAND Corp., Santa Monica, Calif.
SOVIET MILITARY OUTLAYS SINCE 1955.
by Abraham S. Becker. Jul 64, 113p RM 3886 PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Armed forces budgets, USSR), (*Budgets, Armed forces budgets), (*Foreign government, USSR), Military intelligence, Economics, Political science, Military requirements, Costs.

This Memoradum is an outgrowth of continuing research on Soviet national income during the Seven Year Plan period. It is concerned with the growth of total Soviet military expenditures since 1955. Limitations of the data make it impossible to obtain an unambiguous, comprehensive series of estimates of Soviet military outlays. The major goal of this study is to survey and interpret the information available in the open literature. Thus this Memorandum is a critical review of what is and is not known from open sources about

angular momentum to sense inertial rotations. The angular momentum of the nuclear gyro is that of sub-atomic particles of matter. (Author)

AD-602 264 Div. 19
OTS Price $7.60

Massachusetts Inst. of Tech., Cambridge.
SIMPLIFIED SELECTION OF OPTICAL FIX DATA AND A SIMPLIFIED GUIDANCE TECHNIQUE.
Master's thesis.
by Willmore Frederick Holbrow, Jr. Jun 64, 76p
unclassified report

Descriptors: (*Space navigation, Decision theory), (*Celestial guidance, Interplanetary trajectories), Guidance, Midcourse guidance, Perturbation theory, Mathematical models, Target designators, Position finding, Celestial navigation, Projective geometry, Optics, Corrections, Optical target designators.

A selective strategy for optical measurements in interplanetary navigation is shown in which the geometry of the situation dictates the decision. Variable time of arrival guidance is explained and correction velocities are computed using perturbation method and a simplified method based on the line of sight to the destination. The perturbation method is used as the ideal case for finding an empirical relation based on the line of sight. The empirical method derived could be used to check the computer solution in an actual flight since it may be easily calculated manually by an astronaut. (Author)

19. NAVIGATION

AD-601 711 Div. 19, 23
OTS Price $0.50

Human Resources Research Office, George Washington Univ., Washington, D. C.
PICTORIAL NAVIGATION DISPLAYS AND LOW ALTITUDE NAVIGATION.
Consulting rept.,
by Robert H. Wright and Thomas G. Waller. Apr 64, 15p
Contract DA44 188AR02

Unclassified report

Rept. on LOWENTRY.

Descriptors: (*Display systems, Navigation), (*Training devices, Navigation), Pictures, Position finding, Aeronautics, Army training, Low altitude.

The report seeks to describe what a pictorial navigation display system for use in Army aviation should do, how it should look, and what tactical and training implications such a device might have. Several devices commercially available are examined. They are discussed as an indication of what is available at the present time. (Author)

AD-601 910 Div. 19, 1
OTS Price $0.75

National Aviation Facilities Experimental Center, Atlantic City, N. J.
TERRAIN AND WEATHER EFFECTS ON DOPPLER RADAR NAVIGATION SYSTEMS.
Final rept.,
by E. Laskowski. Jan 64, 30p
Proj. 116 30R
FAA RD64 15

Unclassified report

Descriptors: (*Doppler navigation, Doppler system), (*Doppler systems, Doppler navigation), (*Doppler radar, Radar navigation), Airborne, Terrain, Meteorology.

The effects of terrain and weather conditions upon airborne doppler radar performance are described. The extensive flight test data compiled by military and commercial users of the doppler radar and theoretical knowledge of propagation and scattering theory were used as a basis for this study. The effects of terrain and weather are analyzed in terms of the effect upon the signal-to-noise ratio received at the doppler set. In addition, the effect of intense rin cells upon the accuracy of the sensed velocity vector is dscussed. Doppler signal attenuation due to atmospheric gases and various weather conditions is given. Charts illustrate the reduction of signal strength due to increased aircraft operating altitude and increased speed. The need for adequate signal reserve in high-performance aircraft such as the supersonic transport is indicated. (Author)

AD-601 941 Div. 19, 1, 8
OTS Price $2.60

Radio Corp. of America, Los Angeles, Calif.
FEASIBILITY PROOF EQUIPMENT FOR DME-ILS.
Final rept.,
28 Feb 64, 23p
Contract ARDS585, Proj. 115 1 13D

Unclassified report

Descriptors: (*Distance-measuring equipment, Feasibility studies), (*Test equipment (Electronics), Navigational aids), (*Instrument landings, Feasibility studies), Airborne, Radio navigation, Radio equipment, Transponders, Electromagnetic pulses, Timing circuits, Amplifiers, Bandwidth, Ground support equipment, Coding, Pulse transmitters, Compatibility.

One DTB (NSME ground transponder) and two RCA airborne DME's (distance measuring equipment) were modified to provide equipment suitable for in-flight evaluation of the findings of the report entitled, Accurate DME for Use with ILS. (AD-427 721) The modifications consist chiefly of reducing the pulse rise-time, providing two-mode I-F amplifiers to provide wider bandwidth to pass these pulses while maintaining high selectivity, change the timing to the first pulse of the coded pair, provide a constant reply prf which is independent of the number of interrogating aircraft, and preserve the compatibility of the ground and airborne equipments to provide service with unmodified equipments within the VORTAC system. (Author)

AD-602 118 Div. 19, 6, 31
OTS Price $5.60

Southwest Research Inst., San Antonio, Tex.
AN/SRD-14 BEARING TESTS AND NONROTATING SPACED LOOP DIRECTION FINDER DEVELOPMENT.
Interim development rept. for 1 Mar-31 May 64.
by W. M. Sherrill and Douglas N. Travers.
31 May 64, 57p
Contract NObsr89167, Proj. SF0010801, Task 9258

Unclassified report

Rept. on Direction Finder Radio, Shipboard Siting and Design, Study and Development.

Descriptors: (*Direction finding, Radio equipment), (*Radio receivers, Direction finding), Loop antennas, Radiofrequency, Resonance, Automatic gain control, Shipborne, Specifications, Design, Goniometers.

A demonstration of the AN/SRD-14 direction finder was carried out. Bearing and sense performance data over the 100 kc to 4 mc range were obtained with the result that ±5 deg error calibration curves were obtained for 90% of the frequencies tested. Direct sense was observed from 0.2 to 2 mc above which sense was reversed. Modification of the sense antenna circuits is indicated. Modification and testing of the nonrotating spaced loop D/F system showed that ±5 deg error performance was achieved without sense reversal from 2 - 30mc. A two-mc range from 25 - 27 mc encompassing the series resonance of the antennas showed degraded performance and indicates the need of reducing antenna size to shift the resonance out of the operating range. Bearing sensitivity of the twin and goniometer channels was equal within ±2 db. Progress in developing methods of using the HP5100 - 5110A synthesizer for rapid programmed tuning of a twin channel receiver is described. Operation of the synthesizer with the Racal RA. 153 and Intercept Research IR-3 receivers is described. (Author)

AD-602 197 Div. 19
OTS Price $10.10

Massachusetts Inst. of Tech., Cambridge.
BASIC PRINCIPLES OF UNCONVENTIONAL GYROS.
Master's thesis,
by Derek Howard Baker and James Weatherspoon Harrill.
May 64, 124p
Contract AF33 657 7668, DSR Proj. 52 192

Unclassified report

Descriptors: (*Gyroscopes, Theory), Capacitors, Electrostatics, Cryogenics, Electromagnetism, Lasers, Momentum, Magnetic moments, Nuclear engineering.

The basic principles of four representative unconventional gyros are developed. The force between the plates of a charged capacitor manifests itself as the basis for rotor support in the electrostatic gyro. The cryogenic gyro support is dependent on the unusual electric and magnetic behavior of metals at extremely low temperatures. The laser gyro utilizes high frequency electromagnetic radiation instead of

investigations is included in the final report together with the names and thesis titles of graduate scientific personnel associated with the experiments.

AD-601 965 Div. 20, 25
OTS Price $0.50

Naval Ordnance Lab., White Oak, Md.
EXCITED LEVELS OF N15 AND O15.
by A. E. Evans. 9 Mar 64, 15p
Proj. FR43
NOL TR64 46

Unclassified report

Descriptors: (*Nitrogen, Nuclear energy levels), (*Oxygen, Nuclear energy levels), (*Nuclear energy levels, Excitation), Gases, Isotopes, Quantum mechanics, Nuclear shell models, Nuclear spins, Parity, Nuclear forces.

The theory of 1p-shell energy levels is reviewed, with particular emphasis on calculations for N15 and O15. The effect of the relative strengths of space and spin-exchange forces and the spin-orbit force are discussed. Experimental data on the level structures of N15 and O15 are compared with each other and with theory. Particular emphasis is placed upon spin and parity assignments for the first eleven levels in O15. Gaps and discrepancies are pointed out and suggestions made as to means for their resolution. (Author)

AD-602 057 Div. 20, 16
OTS Price $4.00

Massachusetts Inst. of Tech., Cambridge.
FAST NEUTRON SPECTROSCOPY AND DOSIMETRY OF THE MIT REACTOR MEDICAL THERAPY FACILITY BEAM.
Scientific rept. no. 3.
by Roger A. Rydin, Norman C. Rasmussen, and Gordon L. Brownell. May 64, 255p MITNE 47
Contract AF19 604 7492, Proj. 5620, Task 562002
AFCRL 64 404

Unclassified report

Descriptors: (*Nuclear reactors, Medical equipment), (*Dosimeters, Medical equipment), (*Nuclear spectroscopy, Medical research), Radiation effects, Neutron capture, Gamma rays, Scintillation counters, Protons, Photographic emulsions, Polynomials, Iterative methods, Surgical techniques, Fast neutrons, Fission product activity, Decay schemes, Collinators, Neutron spectrum, Therapy, Neoplasms, Brain, Tissues (Biology).

The neutron spectrum was measured using a combination of foil detectors. The absolute thermal flux was measured with gold foils using a beta-gamma coincidence counting technique; the epithermal spectrum was measured by taking cadmium ratios with three different resonance foil materials; and the fast neutron spectrum was measured with ten different threshold foil materials. The fast neutron spectrum was calculated from the threshold foil data using the Weighted Orthonormal and Weighted Orthonormal Polynomial Methods, which were coded for the IBM-7090 computer. These methods were extensively tested on exact data and on data from the ISPRA-1 Reactor. Finally, a composite neutron spectrum was constructed using the results of the fast, epithermal, and thermal flux measurements. This was used to compute the dose rate in tissue using Snyder's Monte Carlo results for a broad beam of neutrons. The calculated gamma-ray dose was then compared to experimental results. (Author)

AD-602 159 Div. 20, 17
OTS Price $0.50

Naval Research Lab., Washington, D. C.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS.
Quarterly progress rept. for 1 Feb-30 Apr 64,
by L. E. Steele, J. R. Hawthorne, and H. E. Watson.
15 May 64, 19p
Contract AT49 5 2110, Projs. RR007 01 46 5409, SR007 01 01, Task 0858
NRL MR1534

Unclassified report

Descriptors: (*Steel, Reactor materials), (*Reactor materials, Radiation effects), (*Radiation effects, Reactor materials), Simulation, Heat treatment, Pressure vessels, Fatigue (Mechanics), Reactor systems components, Power reactors.

This report includes data on the following: (1) simulation of periodic in-service annealing of pressure vessel steels for embrittlement relief, (2) surveillance of radiation embrittlement in Army SM-1A Reactor, and (3) equipment for in-reactor studies of low cycle fatigue performance of steels. (Author)

AD-602 160 Div. 20
OTS Price $0.75

Naval Research Lab., Washington, D. C.
NEUTRON DOSIMETRY SAMPLING OF THE OMRE PRESSURE VESSEL AND GRID PLATES.
Final rept.
by Charles Z. Serpan, Jr. and Lendell E. Steele. 2 Jun 64, 23p
Contract AT49 5 2110, Projs. RR007 01 46 5409
SR007 01 01, Task 0858
NRL MR1538

Unclassified report

Descriptors: (*Organic moderated reactors, Reactor system components), (*Reactor system components, Neutron flux), (*Neutron counters, Neutron flux), Transition temperature, Reactor materials, Mechanical properties, Pressure vessels, Neutron absorption, Radiation damage.

Upon the shutdown of the organic moderated reactor experiment (OMRE) at the National Reactor Testing Station in Idaho, a program was initiated to determine the total neutron dosage and radiation induced transition temperature increase to the pressure vessel and upper grid plates. Drillings were made across the grid plate and the chips were collected from each position to determine the cross-plate neutron exposure gradient. Drillings were taken and collected from the pressure vessel at the fuel centerline, upper and lower grid plate regions, and mid-way between, to determine the vertical neutron flux gradient. The results of the neutron dose analysis of these components are presented. Based upon the results, recommendations are made for testing of the material to determine the transition temperature increase. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-601 699 Div. 20
OTS Price $1.10

High-Energy Physics Lab., Stanford Univ., Calif.
THE PHOTODISINTEGRATION OF THE DEUTERON BY POLARIZED PHOTONS.
by F. F. Liu. May 64, 9p HEPL 329

Unclassified report

Descriptors: (*Deuteron reactions, Photon bombardment), (*Photon bombardment, Deuteron reactions), Deuteron cross sections, Bremsstrahlung, Nuclear energy levels, Photons, Polarization, Radioactive decay.

AD-601 710 Div. 20, 6, 18
OTS Price $0.50

Technical Operations, Inc., Burlington, Mass.
EXPERIMENTAL DETERMINATION OF THE WALL-SCATTERED RADIATION FUNCTION G sub s (OMEGA).
Summary of research rept.
by James L. Jones. Jun 64, 4p
Contract OCD OS62 14, Task 1111A

Unclassified report

Report on Shelter Research 1100, Protection Studies.

Descriptors: (*Shelters, Radiological contamination), (*Dose rate, Determination), (*Scattering, Radioactivity), Experimental data, Safety, Functions, Scientific research, Radiation measurement systems, Structural parts.

A significant portion of the dose rate in a structure exposed to a field or radioactivity can be due to radiation scattered by the walls into the sensitive volume. In the analysis of structures based on the methods of the Engineering Manual, the radiation scattered from the wall is represented by a function G sub s (omega), where omega is the solid angle fraction subtended by the structure at the detector. This function was derived from Spencer's data for air-scattered radiation and was assumed dependent only on omega; i.e., walls subtending equal solid angles would scatter equal dose rate to the detector, regardless of their respective positions with respect to the source plane. These two assumptions required direct testing under experimental circumstances that would give unambiguous answers. These answers could then be compared directly with those given by the Engineering Manual method. Direct comparison of this with the experimental dose rate gave agreement within 20%, except for the highest and lowest positions, in the thin-walled structure and in the lowest position in the thicker cylinders.

AD-601 719 Div. 20, 6, 18
OTS Price $1.75

Technical Operations, Inc., Burlington, Mass.
EXPERIMENTAL DETERMINATION OF THE WALL-SCATTERED RADIATION FUNCTION G sub s (OMEGA).
Final rept.
by James L. Jones and John F. Batter. Dec 63, 67p
TO B63 88
Contract OCD OS62 14, Task 1111A

Unclassified report

Descriptors: (*Shelters, Radiological contamination), (*Dose rate, Determination), (*Radioactivity, Scattering), (*Shielding, Radioactive fallout), Experimental data, Mathematical prediction, Monte Carlo method, Moments, Functions, Cylindrical bodies, Structural parts, Steel, Radiation measurement systems.

An investigation was made of the variation of dose rate with solid angle fraction in structures of simple geometries. The experimentally determined infinite field dose rate was compared with calculations based on the Engineering Manual and Spencer's Monograph. Except for the thinnest walls, the values of experimental and calculated dose rates were within 20%. This was greater than the estimated experimental error, and the difference followed a pattern that suggests a definite discrepancy between experiment and calculation. The same pattern of discrepancies was found in a direct comparison of experimental and theoretical values of skyshine radiation. (Author)

AD-601 797 Div. 20, 2
OTS Price $0.75

Aerospace Corp., Los Angeles, Calif.
ARTIFICIALLY INJECTED ELECTRONS AT LOW ALTITUDES.
by J. D. Mihalov, F. S. Mozer, and R. S. White.
25 May 64, 25p TDR269 4260 20 2
Contract AF04 695 269
SSD TDR64 99

Unclassified report

Descriptors: (*Electrons, Atmosphere), (*Nuclear explosions, Atmosphere), Nuclear particles, Fission products, Energy, Distribution, Bremsstrahburg, Measurement, Scientific satellites, Radiation measurement systems, Telemetering data, Data processing systems, Maps, Nuclear physics.

The electrons which were injected into the radiation belts in 1962 by the United States and the Soviet Union high-altitude nuclear explosions are studied. Data are used from detectors on two low-altitude, near-polar, earth-oriented satellites, 1962 beta epsilon launched in October before the Soviet injections, and 1962 beta omicron launched in November after the Soviet injections. Both flights occurred after Starfish, the U. S. high-altitude nuclear explosion of July 9, 1962. These flights offered the unique opportunity of studying the effects of the Soviet injections on the trapped radiation at low altitudes. In addition to particle injections, particle lifetimes and atmospheric loss mechanisms are studied.

AD-601 884 Div. 20, 32
OTS Price $0.50

Indiana Univ., Bloomington.
FINAL REPORT NUCLEAR SPECTROSCOPY .
Rept. for 1 Apr 55-31 Mar 64,
31 Mar 64, 12p
Contract Nonr1705 01, continuation of Contract N6ori48 01,
Proj. NR024 006

Unclassified report

Descriptors: (*Nuclear spectroscopy, Bibliographies), (*Bibliographies, Nuclear spectroscopy), (*Decay schemes), (*Radioactive decay), Nuclear forces, Nuclear properties, Atomic structure, Radioactive isotopes, Nuclear reactions, Cyclotrons, Beta-ray spectroscopy, Gamma-ray spectroscopy, Beta-ray spectrum, Particle acceleration techniques, Scientific personnel, Training, Correlation techniques, Atomic energy levels.

Information about the structure of the nuclei of atoms and the nature of basic nuclear forces is recorded in a series of reports covering the period 1 March 1946 to 31 March 1955. Measurements were carried out on various phenomena associated with radioactive decay of isotopes produced either by bombardment in the cyclotron or in a nuclear reactor. The investigations involved: (1) the determination of decay schemes and energy level assignments; (2) studies of the detailed shapes of beta spectra in both allowed and forbidden transitions; and (3) beta-gamma angular correlation measurements. A list of 63 publications supporting the results of these

22. ORDNANCE

AD-601 728 Div. 22
OTS Price $9.60

Ordnance Engineering Associates, Inc., Des Plaines, Ill.
CONCEPT AND FEASIBILITY STUDIES OF MUZZLE BRAKE BLAST SUPPRESSION DEVICES FOR 105MM and 155MM HOWITZERS.
Final rept. for 13 Dec 62-26 Feb 64,
by Samuel Levin and A. D. Kafadar. 26 Feb 64, 111p
Contract DA11 070AMC11, Proj. 2070

Unclassified report

Descriptors: (*Howitzers, Shock waves), (*Shock waves, Attenuation), (*Gun barrel attachments, Design), Blast, Inhibition, Pressure, Stresses, Projectiles, Interior ballistics, Gas flow, Feasibility studies.

Results of the following studies are presented: analytical determination of overpressure maps resulting from firing Howitzers with muzzle blast suppression devices; analyses for evaluating the effects of design parameters comprising the device; techniques for computing the dimensionless pressure and mass rate of discharge - dimensionless time histories in the suppression device; the effect of time which the projectile remains in the suppression device; design parameters of the device which create attenuated overpressures in the crew area; a proposed design for the 105mm Howitzer blast supression device and the stress analysis of the design; an analytical study relating to the directional effects of blast waves.

AD-601 739 Div. 22, 9
OTS Price $1.50

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
A STUDY OF LONGITUDINAL DYNAMIC STABILITY CRITERIA FOR TORPEDOES,
by A. Strumpf and G. Anguil. Dec 63, 51p SIT-DL 1001
Contract NOw61 0910d, Proj. 330

Unclassified report

Descriptors: (*Torpedoes, Stability), (*Hydrodynamics, Torpedoes), Fluid dynamic properties, Equations, Motion, Perturbation theory, Mathematical analysis, Pitch (Motion), Velocity, Performance (Engineering), Center of gravity.

The limitations of conventional longitudinal dynamic stability analyses are assessed for the case of a deeply submerged torpedo with a level, straight course equilibrium condition. It is found that the motion equations used previously for stability analyses are valid only when applied to a neutrally buoyant body with the center of gravity directly above or below the center of buoyancy. In other cases, the equilibrium elevator and pitch angles are not zero and this causes certain first order hydrodynamic and inertial terms to appear in the equations which have been ignored in past analyses. The most important of these are hydrodynamic derivatives of vertical force and pitch moment with respect to longitudinal velocity. It is shown that these omissions can cause erroneous predictions of dynamic stability. The results of the study are incorporated in a set of simplified longitudinal stability criteria. (Author)

AD-601 773 Div. 22, 17
OTS Price $1.00

Naval Weapons Lab., Dahlgren, Va.
WEDGE PENETRATION IN A THICK TARGET.
by William G. Soper. 28 May 64, 35p
Task R01101001
NWL 1914, NAVWEPS 8337

Unclassified report

Descriptors: (*Aluminum, Targets), (*Targets, Aluminum), (*Wedges, Penetration), (*Steel, Wedges), Shear stresses, Friction, Strain (Mechanics), Sensitivity, Dynamics, Deformation, Heat transfer, Hardening, Impact shock, Velocity, Terminal ballistics, Scientific research.

Analysis of the penetration of a wide wedge into a thick aluminum target was compared with penetration experiments at velocities from 1 to 500 ft/sec. The penetration data follow the rough wedge solution at low velocity but approach the frictionless case at several hundred ft/sec. This behavior is ascribed to adiabatic heating and consequent softening of target material adjacent to the penetrator. It was concluded that a strain-rate-insensitive Tresca yield stress is a satisfactory constitutive equation for the material but that work-hardening and thermal phenomena must be included for accurate analysis. (Author)

AD-601 922 Div. 22, 8
OTS Price $1.50

Weston Instruments and Electronics Div., Daystrom, Inc., Newark, N. J.
LOW BAND PASS TRANSFORMER EX 23 MOD O.
Final rept., 1 Jul 62-30 Jun 64.
30 Jun 64, 53p
Contract N178 8080

Unclassified report

Descriptors: (*Transformers, Electromagnetic shielding), (*Explosives initiators, Electromagnetic shielding), Electromagnetic fields, Electrostatic fields, Extremely low frequency, Very low frequency, High frequency, Voltage, Design, Performance (Engineering), Attenuation, Radiofrequency interference, Coils, Electrical impedance, Test equipment (Electronics); Inductance, Firing circuits.

A low band pass transformer was developed which provides protection for weapon electro-explosive devices (EED) in a-c firing circuits against spurious induced energies from electro-magnetic and electro-static fields. The transformer is designed to operate from an excitation of 45 watts for a period of 1.0 millisecond, minimum, over the pass band frequency range of 100 cycles per second to 10 kilocycles per second; at 28 volts 400 cps it delivers a minimum of 11.3 watts (6 db) to a one ohm resistive load. It is capable of dissipating continously 10 watts of incident power over the stop band frequency of 100 kilocycles per second to 10 kilomegacycles per second and has a power attenuation of 40 db minimum above 100 kilocycles per second into a one ohm resistive load. The unit is cylindrical, 1.38 inches in diameter and 2.0 inches long excluding connectors, and weighs 182g (.4 lbs.). (Author)

AD-601 964 Div. 22, 15, 30, 31
OTS Price $1.25

Navy Electronics Lab., San Diego, Calif.
OPTIMUM CONTROL OF A NONLINEAR SECOND-ORDER PLANT USING A GENERAL-PURPOSE COMPUTER.
Research and development rept. for 1 Aug 63-31 Jan 64.
by M. E. Jensen. 24 Apr 64, 46p
Proj. SS191 001, Task 7128
NEL 1220

Unclassified report

Descriptors: (*Control systems, Digital computers), (*Digital computers, Control systems), (*Fire control computers, Fire control systems), Optimization, Nonlinear systems, Linear systems, Shipborne, Systems engineering, Real time, Naval operations, Feasibility studies.

This report covers the development of optimum digital controllers for representative shipboard components. Tests using the Naval tactical data system computer CP-642A/USQ-20(V) were conducted, and various linear and nonlinear controllers were tried. Sampling rates of about 10 cycles per second were sufficient to operate the gun with minimum errors.

Division 21 - NUCLEAR PROPULSION

AD-602 177 Div. 20
OTS Price $8.10

Stanford Linear Accelerator Center, Stanford Univ., Calif.
EMPIRICAL PARTIAL WAVE ANALYSIS OF pi + p ELASTIC SCATTERING ABOVE 1 GeV/c,
by Martin L. Perl and Mary C. Corey. May 64, 90p
SLAC Pub28

Unclassified report

Descriptors: (*Elastic scattering, Mathematical analysis), Differential cross section, Elementary particles, Pions, Nucleons, Nuclear reactions, Absorption, Curve fitting, Least squares method, Data, Tables, Graphics, Nuclear physics.

A partial wave equation was used to fit most of the recent pi + p differential cross section measurements above 1 GeV/c. Differential cross section measurements of pi(-) + p at 2.01 GeV/c and of pi(+) + p at 2.02 GeV/c previously published only in graphical form are given in the appendix.

AD-602 198 Div. 20, 9
OTS Price $2.25

Naval Ordnance Lab., White Oak, Md.
THE USE OF A KNOCK-OFF TUBE AS A QUICK PRESSURE-RELEASE MECHANISM,
by Robert L. Davis. 4 May 64, 88p
Task 285
NOL TR63 134

Unclassified report

Descriptors: (*Reactor safety systems, Release mechanisms), (*Containment, Release mechanisms), Piezoelectric gages, Compressible flow, Reactor accidents, Fluid flow, Viscosity, Oscilloscopes, Trigger circuits, Laminar flow, Hydraulic pressure pumps, Calibration, Instrumentation, Equations, Pressure.

An analysis of the use of a knock-off tube as a quick pressure-release mechanism for a piezoelectric gage calibration system is presented. This system is capable of developing pressures up to 50,000 psi in a closed oil filled chamber. An equation relating the pressure-release time to the initial conditions of the calibration system was derived and verified for select choices of initial conditions that are compatible with requirements of the NOL reactor-vessel containment program. (Author)

21. NUCLEAR PROPULSION

No Entries

23. PERSONNEL AND TRAINING

AD-601 930 Div. 23, 18
OTS Price $3.00

Applied Psychological Services, Wayne, Pa.
CIVIL DEFENSE COURSE DEVELOPMENT TECHNIQUES. INSTRUCTOR'S GUIDE FOR A COURSE IN STATE LEVEL CIVIL DEFENSE STAFF OPERATIONS.
by Dorothy.E. Fletcher and Arthur I. Siegel. Jun 64, 152p
Contract OCD OS62 121

Unclassified report

Descriptors: (*Civil defense systems, Training), Civil defense personnel, Civilian personnel, Instructors, Control, Shelters, Defense systems, Transportation, Communication systems, Warning systems, Feasibility studies.

An instructor's guide for a course in state level civil defense staff operations is presented. The guide represents an adjunct to actual course materials developed separately. The total result constitutes the end products emerging from a feasibility study into techniques for developing civil defense courses. (Author)

AD-601 931 Div. 23, 18
OTS Price $5.00

Applied Psychological Services, Wayne, Pa.
CIVIL DEFENSE COURSE DEVELOPMENT TECHNIQUES. A COURSE IN STATE LEVEL CIVIL DEFENSE STAFF OPERATIONS.
by Dorothy E. Fletcher and Arthur I. Siegel. Jun 64, 364p
Contract OCD OS62 121

Unclassified report

Descriptors: (*Civil defense systems, Training), Civil defense personnel, Civilian personnel, Instructors, Control, Shelters, Defense systems, Transportation, Communication systems, Warning systems, Feasibility studies.

The results of developing for civil defense a course based on techniques customarily employed in developing courses for weapon system's hardware development are presented. The results are presented in the form of a course in state level civil defense staff operations. Preliminary test of the materials suggests that a vital, needed course was obtained and that, at least for the subject matter area investigated, the technique is appropriate. (Author)

AD-601 943 Div. 23, 28
OTS Price $1.00

Human Resources Research Office, George Washington Univ., Washington, D. C.
A TEST OF A METHOD OF CONVERTING PROFICIENCY SCORES TO LEARNING TIME SCORES.
Research memo.
by John A. Cox, Lynn M. Boren, and Robert O. Wood, Jr. Jun 64, 40p
Contract DA44 188AR02

Unclassified report

Descriptors: (*Achievement tests, Training), (*Learning, Time), (*Training devices), Military personnel, Army training, Control simulators, Job analysis, Performance (Human), Correlation techniques, Statistical tests.

A method of converting proficiency scores to learning time scores for use in evaluating alternate types of training devices using differences in learning times as the basis for comparison is described. An empirical application of the conversion technique and a demonstration of the failure of the process to show valid prediction of learning time because of differences in the training methods used is also recounted. (Author)

AD-601 972 Div. 23, 18, 28
OTS Price $0.50

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
PEER RATING STABILITY IN CHANGING GROUPS.
by Francis F. Medland and Jerome L. Olans. Apr 64, 12p
Proj. 2J024701A722
APRO TRN142

Unclassified report

Descriptors: (*Leadership, Determination), (*Army personnel, Leadership), Statistical analysis, Statistical functions, Group dynamics, Military psychology, Military training.

The purpose of the project was to evaluate peer ratings as predictors of NCO potential and to study the relative effectiveness of various methods of obtaining peer ratings. Operational peer ratings obtained in four companies at the end of four weeks of Basic Combat Training were compared with peer ratings at the end of the 8th week. For two companies, squads within a company were rearranged so that the second rating was made by different raters than the first. In the two remaining companies, squads remained intact. Cadre ratings were obtained for comparison with peer ratings, as were also later peer and cadre ratings for those men in available AIT assignments. Peer ratings of leadership potential in groups of 12 to 16 men had substantial reliability over 4 to 16 weeks. The reliability held whether individuals were in stable groups and rated by the same men a second time, or in changing groups and rated by different men. Peer ratings were more reliable than cadre ratings obtained under comparable circumstances. Since a man rated high as a leader in one group is likely to be equally acceptable as a leader in a different group, management can use peer ratings as dependable indexes in assigning men to positions of leadership regardless of the composition of the group. (Author)

AD-602 010 Div. 23, 32
OTS Price $14.50

Applied Psychological Services, Wayne, Pa.
TASK COMPENDIUM FOR SELECTED STATE LEVEL CIVIL DEFENSE POSITIONS,
by Philip Federman and Arthur I. Siegel. Jun 64, 211p
Contract OCD OS62 121

Unclassified report

Descriptors: (*Civil defense systems, Job analysis), (*Job analysis, Civil defense personnel), (*Personnel management, Civil defense systems), Time studies, Indexes, Classification, Language.

This is a task compendium for selected state level civil defense positions. Its purpose and function is an example of how a master file system for various civil defense positions might be organized. The compendium not only contains information relating to the tasks of the various positions, but it also contains information relative to the operational categories under which the various duties performed by the position holders are classified, the objects that are acted upon when the tasks are performed, and the criticality values assigned to each task in each time phase of the civil defense cycle. Moreover, it represents an initial step towards language standardization within the civil defense job evaluative framework. (Author)

A 50-cycle-per-second sampling rate, although generally reducing the errors by a factor of 2, required a five-fold increase in computer time, and was judged to be unsatisfactory. Bang-bang control had little value in this application. (Author)

AD-601 990 Div. 22
OTS Price $0.75

Naval Ordnance Lab., White Oak, Md.
INITIATION OF EXPLOSIVES BY EXPLODING WIRES. IV. EFFECT OF WIRE LENGTH ON THE INITIATION OF PETN BY EXPLODING WIRES.
by Howard S. Leopold. 4 May 64, 25p
NOL TR64 61

Unclassified report

Descriptors: (*Explosives initiators, Exploding wires), (*Exploding wires, Explosives initiators), (*PETN, Detonations), Wires, Platinum, Physical properties, Capacitors, Energy, Density.

The effect of wire length on the initiation of PETN by exploding platinum wires was investigated using a one microfarad capacitor charged to 2000 volts as the energy source. The energy density deposited in the wire was found to increase with decreasing wire length but there is an optimum length for effecting detonation. This is apparently governed by the energy density deposited in the wire and a minimum critical volume of explosive which must be initiated. (Author)

AD-601 995 Div. 22, 7
OTS Price $8.60

International Resistance Co., Philadelphia, Pa.
SPECIAL PURPOSE FUSE SWITCHES.
Final rept., for 1956-30 Jun 64,
by Randolph F. Hill. 30 Jun 64, 91p
Contracts DA36 034 507ORD97; DA36 034ORD3326

Unclassified report

Descriptors: (*Fuze functioning elements, Electric switches), (*Electric switches, Fuze functioning elements), Projectiles, Fuzes (Ordnance), Acceleration, Loading (Mechanics), Stresses, Subminiature Electric equipment, Design, Manufacturing methods, Feasibility studies.

Research on the design, development and manufacture of special purpose electro-mechanical switches suitable for use in artillery fuses and capable of withstanding high gravity loading is reported.

AD-602 020 Div. 22
OTS Price $1.00

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
WEAPON-TO-WEAPON PROPAGATION TEST I AND II.
by Henry L. Herman and Robert M. Michael. May 64, 31p
FA TM1425

Unclassified report

Descriptors: (*Explosive materials, Storage), (*Weapons, Storage), (*Explosions, Propagation), Charges (Explosive), Detonations, Tests, Containers, Reinforced concrete, Explosion effects, Detonation waves.

An evaluation of weapon-to-weapon propagation involving quantitative blast parameter measurements was performed. Two cased donor charges -- one of 50 lbs., one of 100 lbs. -- were fired in separate tests to ascertain the effectiveness of a barricade system in preventing acceptor charge detonation when the system is confined within a steel-reinforced concrete storage structure. The quantitative information resulting from these measurements is presented in tabular form. (Author)

AD-602 098 Div. 22
OTS Price $2.50

General Electric Co., Burlington, Vt.
PROJECT VULCAN, RESEARCH AND DEVELOPMENT.
Summary rept. for 16 Jun 61-16 Apr 64,
by J. M. Seeman. 16 Jun 64, 112p R64APB19
Contract DA19 020ORD5455, Proj. SA7663

Unclassified report

Descriptors: (*Aircraft guns, Design), Automatic weapons, Guns, Torque, Reduction, Life expectancy, Gun components, Feed mechanisms, Recoil mechanisms, Springs, Gun chargers, Pneumatic systems, Mechanical drawings, Photographs, Ordnance.

Summarization of work performed on the M61 Gun (20-MM). Topics include: Torque reduction and improved parts life; Gun components; Feeders; Targeting studies; Muzzle blast study; Recoil reaction study; Gun gas drive; and Gun gas drive spring starter.

AD-602 112 Div. 22, 2
OTS Price $2.25

Ballistic Research Labs., Aberdeen Proving Ground, Md.
HANDBOOK FOR PREDICTION OF AIR BLAST FOCUSSING.
by Beauregard Perkins, Jr., and Willis F. Jackson.
Feb 64, 89p
Proj. 1M010501A006
BRL 1240

Unclassified report

Descriptors: (*Airburst, Meteorological parameters), (*Meteorological parameters, Blast), (*Shock waves, Propagation), Explosions, Detonation waves, Pressure, Damage, Damage control, Velocity, Data, Sound.

The handbook sets forth the procedures and techniques for gathering and evaluating the meteorological data necessary for predicting the focus of air blast from surface or near surface explosions, and it describes simple devices to speed the calculations. All the graphs necessary for the evaluation are gathered for easy reference. Eighty-seven sets of vertical velocity gradients and the resulting sound ray paths are assembled for rapid determination of focal distance. These should cover most of the conditions to be expected throughout the continental United States. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-602 185 Div. 24
OTS Price $0.50

American Meteorological Society, Boston, Mass.
NEW CAMERA FOR HIGH-SPEED PHOTOGRAPHY,
by G. L. Shnirman, A. S. Dubovik, P. V. Kevlishvili, A. B. Granigg and I. A. Korolev. Jan 64, 8p
AmMetSoc T-R-420
Contract AF19 604 6113
TT 64 11831

Unclassified report

Novaya Kamera dlya Vysokoskorostnoi S'emki, trans. of Akademiya Nauk SSSR. Vestnik, 1963 v. 33 no. 5, p. 73-75.

Descriptors: (*High-speed photography, Cameras), (*Cameras, Motion picture cameras), Optical equipment, Mirrors, Optical scanning, Rotating-mirror cameras, Design, Operation, Photography, USSR.

The ZhLV-1 high-speed, slave, slow-motion camera is described. This camera is convenient in that it can be used as a framing camera for photography at a speed of 45,000 to 4,200,000 frames per second and as a streak or smear camera with slit scanning and time resolution up to 2 x 10 to the minus 8th power sec. The high speed of rotation of the scanning mirrors (up to 90,000 rpm) is achieved by maintaining a vacuum in the interior of the camera. The frame size and image scale can be selected according to the experimental conditions. The focal length can be varied from 50 to 450 mm. A large volume of information is assured by the high photographic resolution on the 35-mm film with a large frame height and high speed.

AD-602 246 Div. 24
OTS Price $2.00

Technical Operations, Inc., Burlington, Mass.
CONTACT PRINTING WITH COHERENT LIGHT.
Final rept.
by H. Heckscher and B. J. Thompson. May 64, 72p
Contract AF30 602 3139, Proj. 5534, Task 553401
RADC TDR64 120

Unclassified report

Descriptors: (*Photographic printers, Lasers), (*Lasers, Photographic printers), Optical equipment, Feasibility studies, Mirrors, Illumination, Interference, Diffraction, Photographic emulsions, Neon, Helium, Films, Nitrogen, Energy, Spectra (Visible and Ultraviolet).

The high degree of collimation and the high energy densities that can be simultaneously obtained from the output of a laser make it an attractive proposition as a light source in contact printers. However, special problems do arise in such a system mainly from the high degree of spatial and time coherence of the laser output. These properties cause deleterious interference and diffraction effects in many printing systems. Experiments are described using a He-Ne gas laser as a light source associated with standard printing frames and continuous drum printers. The troublesome effects, particularly the interference fringes, are illustrated and a method is shown for eliminating these effects through the introduction of a suitable liquid between the emulsions. Recommendations are made for: (1) feasibility study with improved optical equipment to obtain high resolution, (2) experimenting with Kalvar and diazo-type materials using the nitrogen gas laser as a source, (3) experimenting with the diazo-type material that has recently been sensitized in the green region of the visible spectrum, and (4) more intensive study of the effect of coherence upon exposure. (Author)

Division 23 - PERSONNEL AND TRAINING

AD-602 041 Div. 23, 5, 28
OTS Price $2.50

Bio-Dynamics, Inc., Cambridge, Mass.
DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. I. CONCEPTUAL AND EXPERIMENTAL APPROACHES.
by Thomas B. Sheridan and Sylvia R. Mayer. Dec 63, 105p
Contract AF19 628 455, Proj. 7682, Task 768204
ESD TDR64 234

Unclassified report

Descriptors: (*Command and control systems, Training devices), (*Training devices), Behavior, Decision making, Training, Learning, Education, Display systems, Computers, Models (Simulations), Language, Game theory, Job analysis, Automation, Design.

The report describes exploratory developments on laboratory models of automated training subsystems for information systems. Such subsystems could provide future information systems with the capability to train their users on-the-job. The report outlines on-going studies concerned with (1) the unique training requirements in advanced information systems; (2) new training concepts and techniques to meet these require ments; and (3) an analytic tool to describe functional and structural overlap of equipment required for both operations and training. (Author)

AD-602 042 Div. 23, 5, 28
OTS Price $1.00

Bio-Dynamics, Inc., Cambridge, Mass.
DESIGN AND USE OF INFORMATION SYSTEMS FOR AUTOMATED ON-THE-JOB TRAINING. II. DESIGN OF SELF-INSTRUCTIONAL FEATURES.
by Thomas B. Sheridan, Benjamin C. Duggar, and Sylvia R. Mayer. Jan 64, 34p
Contract AF19 628 455, Proj. 7682, task 768204
ESD TDR64 234

Unclassified report

Descriptors: (*Command and control systems, Training devices), (*Training devices, Teaching machines), Behavior, Human engineering, Coding, Programming (Computers), Decision making, Training, Learning, Education, Computers, Language, Automation, Models (Simulations), Design.

The report is concerned with human engineering factors in the design of information systems. In particular it is addressed to the design of self-instructional features for these systems. It describes theories, methodology, and design principles for implementation of self-instructional features. The design principles were induced from the exploratory research on laboratory models of information systems which is reported in Volume I of this series (AD-602 041), from studies on current information systems, and from a literature review. The operational concepts underlying the study are stated, and an equipment design philosophy is proposed to complement this operational concept. (Author)

AD-602 056 Div. 23, 28, 30
OTS Price $1.60

Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
THEORY AND RESEARCH IN PROGRAMMED INSTRUCTION.
by John S. Abma. Jun 64, 15p
Proj. 1710, Task 171007
AMRL P74

Unclassified report

Presented to the Annual Conference (15th) of the American Institute of Industrial Engineers at Philadelphia, Pa., 15 May 1965.

Descriptors: (*Teaching machines, Effectiveness), (*Training, Theory), (*Programming (Computers), Education), Learning, Linear programming, Reaction (Psychology), Automation.

Programmed instruction may be implemented within a systems approach to education. The system provides for feedback loops which permit modification of training materials on the basis of known effectiveness. Measurement is a crucial consideration in assuring that a given course or method is effective. Theories of learning and programming suggest many ways to proceed. Only applied evaluative experimentation can determine the usefulness of a given approach. Adjunctive, intrinsic and linear programming are discussed. Experiments call into question some current applications of features based upon theory, such as overt responding and reinforcement. It is possible to automate the various approaches to programmed instruction. (Author)

Descriptors: (*Antiferromagnetism, Phase studies), (*Statistical mechanics, Antiferromagnetism), Magnetic properties, Magnetic fields, Paramagnetic materials, Magnetic resonance, Manganese compounds, Oxides, Chromium compounds, Fluorides, Bromides, Copper compounds, Iron compounds, Magnetic materials, Phase shift, Rubidium compounds, Mathematical models, Thermodynamics, Anisotropy, Temperature.

The spin-flop and flop-para phase transitions of a simple uniaxial antiferromagnet are analyzed by a Green function analysis. The temperature dependence of the field for antiferromagnetic resonance, the parallel and perpendicular susceptibilities, and the sublattice magnetizations are also computed. It is shown that these effects are sensitive to the temperature dependent renormalization of spin wave energies, and this effect is analyzed in some detail. Results are in good semi quantitative agreement with AFMR in MnF2 and Cr2O3, with the phase transition boundaries in MnBr2.4H2O, and with the perpendicular susceptibility of MnF2, and they give reasonable estimates of the metamagnetic transitions in materials such as FeCO3 and FeBr2. (Author)

AD-601 734 Div. 25
OTS Price $0.75

David Taylor Model Basin, Washington, D. C.
EFFECTIVE AREA OF RING STIFFENERS FOR AXIALLY SYMMETRIC SHELLS.
by R. D. Short. Mar 64, 25p
DTMB 1894

Unclassified report

Descriptors: (*Stiffened cylinders, Structural shells), (*Deformation, Structural shells), (*Structural shells, Rings), Effectiveness, Flanges, Stresses, Loading (Mechanics), Graphics, Numerical analysis, Differential equations, Integration, Cylindrical bodies, Elasticity, Thickness.

The effectiveness of T- and I-section ring stiffeners in axially symmetric shells undergoing axially symmetric deformations is examined under the assumption that the thicknesses of the shell and flanges and web of the stiffeners are small compared to the other dimensions. Curves are presented for obtaining the effective area and the flange stress of T-stiffeners. Approximate formulas for stiffeners with depth of stiffener small compared to the radius of the shell are also presented. (Author)

AD-601 750 Div. 25
OTS Price $2.60

Aerospace Corp., Los Angeles, Calif.
BENDING DUE TO RING LOADING OF A CYLINDRICAL SHELL WITH AN ELASTIC CORE.
by John C. Yao. 20 May 63, 28p, TDR169 3560 30 TN5
Contract AF04 695 169
SSD TDR63 123

Unclassified report

Descriptors: (*Cylindrical bodies, Mechanical properties), Deflection, Loading (Mechanics), Load distribution, Elasticity, Moments, Integral equations, Functions, Stresses, Deformation.

The problem of a long, thin cylindrical shell with a soft core and subjected to a radial ring load is solved with the use of the Boussinesq-Neuber stress function for the core in conjunction with classical shell theory. Numerical results for stress and displacement fields are given for various values of the cylinder geometry parameters and material constants. (Author)

AD-601 759 Div. 25, 4
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DIRECT MEASUREMENT OF THE INTERPHASE SURFACE ENERGY ON THE CRYSTAL-FUSION BOUNDARY [AND] DETERMINATION OF THE TEMPERATURE DEPENDENCE OF THE ENERGY OF ACTIVATION OF THE GROWTH OF A NEW PHASE,
by F. K. Gorskiy and L. O. Meleshko. 15 May 64, 10p
FTD TT64 161; TT 64 11798

Unclassified report

Unedited rough draft trans. of mono. Kristallizatsiya i Fazovye Perekhody (Crystallization and Phase Transitions) n.p., 1962, p. 58-61, 66-70.

Descriptors: (*Crystals, Phase studies), (*Crystallization, Heat of activation), Surface properties, Energy, Transitions, Thermodynamics, Sulfur, Naphthalenes, Alcohols, Salicylates, N-heterocyclic compounds, USSR.

AD-601 761 Div. 25, 8
OTS Price $0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ABOUT ONE MECHANISM OF GENERATING PLASMA OSCILLATIONS IN A SEMICONDUCTOR AND PROPAGATION OF ELECTROMAGNETIC ENERGY IN A CIRCULAR WAVE GUIDE FILLED BY A GAS-DISCHARGE PLASMA WITH VARIABLE PARAMETERS WITH RESPECT TO THE CROSS SECTION.
by V. L. Bonch-Bruevich, Yu. V. Gulyaev, and V. M. Ginzburg. 26 May 64, 29p
FTD TT64 292; TT 64 11800

Unclassified report

Unedited rough draft trans. of Radiotekhnika i Elektronika (USSR) 1963, v. 8, no. 7, p. 1179-1186, 1269-1274.

Descriptors: (*Plasma oscillations, Semiconductors), (*Electromagnetic waves, Propagation), (*Waveguides, Gas discharges), Plasma physics, Equations, Electric fields, Velocity, Dielectrics, Experimental data, Electron tubes, Antennas, Electronics, Radio waves, Electrons, Charged particles, Acoustics, Optics, USSR.

AD-601 762 Div. 25, 2
OTS Price $0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE NATURE OF GRAVITATION.
by V. V. Radzievskii and I. I. Kagal'nikova. 8 May 64, 25p
FTD TT64 323; TT 64 11801

Unclassified report

Unedited rough draft trans. of Vsesoyuznoe Astronomo-Geodezicheskoe Obshchestvo. Byulleten' (USSR) 1960, no. 26(33) p. 3-14.

Descriptors: (*Gravity, Theory), (*Relativity theory, Field theory), (*Quantum mechanics), (*Space environmental conditions, Gravity), Astronomy, Geophysics, Tides, Atmospheric tides, Solar systems, Momentum, USSR, Absorption.

This study of the nature of gravitation is concerned with the possibility of a synthesis of the numerous unified and modernized classical hypotheses of gravitation such that each of the inherent, isolated, internal contradictions or disagreements with experimental data might be successfully explained. Discussed are: (1) the Lomonosov-Lesage hypothesis; (2) Majorana's experiment, Russel's criticism, and (3) the synthetic hypothesis.

25. PHYSICS

AD-601 690 Div. 25, 4, 16
OTS Price $0.50

Harvard Univ., Cambridge, Mass.
STRUCTURES OF BIOLOGICALLY ACTIVE MOLECULES.
Final rept., 1 Dec 59-30 Nov 63
by William N. Lipscomb. 30 Nov 63, 6p
Contract AF49 638 809
AFOSR 64 1110

Unclassified report

Descriptors: (*Molecular structure, Bibliographies), (*Bibliographies, Biochemistry), Crystal structure, Stereochemistry, X-ray diffraction analysis, Boron compounds, Organic compounds, Alkaloids.

A bibliography of 10 references is given on the molecular and crystal structure of some biologically active molecules.

AD-601 694 Div. 25
OTS Price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
EFFECTS OF A STATIC MAGNETIC FIELD ON THE CHARACTERISTICS OF A HELIUM-NEON LASER.
by Paul Fenster. Apr 64, 39p PIBMRI 1222 64
Grant AF AFOSR453 63
AFOSR 64 1121

Unclassified report

Descriptors: (*Lasers, Magneto-optic effect), (*Magneto-optic effect, Lasers), Magnetic fields, Amplifiers, Helium, Neon, Light, Propagation, Polarization, Equations, Theory, Experimental data.

The application of even modest magnetic fields to the amplifying material in the helium-neon laser profoundly modifies the operational characteristics of the laser. The magnetic field introduces a Faraday effect and a Zeeman effect. Both of these effects tend to reduce the power output of the laser. A simple theory is set forth which describes the impact of these effects on the output. The experimental work which was carried out with a laser oscillating at a wavelength of 6328 A is generally in agreement with the theory. An attempt is made to explain some observed deviations from the expected results. (Author)

AD-601 703 Div. 25, 30
OTS Price $2.60

Stanley Thompson Labs., Columbia Univ., New York.
ELECTRICAL PHENOMENA AT THE ICE/WATER INTERFACE.
Technical rept. no. 1
by Jack H. Schulman and H. C. Parreira. Jun 64, 25p
Contract Nonr266 64

Unclassified report

Descriptors: (*Measuring devices (Electrical and Electronic), Design), Ice, Water, Surface area, Electrical properties, Freezing, Voltage, Hydrostatics, Recording systems, Measurement.

Experimental equipment designed for the purpose of investigating electric phenomena which occur at the ice/water interphase is described. Two aspects of the same problem are to be studied: (1) electric potentials generated whenever liquid water is forced through ice capillaries under pressure gradients; those are known as streaming potentials. (2) electric potentials which appear during the freezing of water of dilute aqueous solutions; these are called freezing potentials.

AD-601 709 Div. 25
OTS Price $0.50

Carborundum Co., Niagra Falls, N. Y.
PHASES AND TWINNING IN C2Al3B48 (BETA AlB12).
Technical rept. no. 2
by V. I. Matkovich, R. F. Giese, Jr. and J. Economy. Jun 64, 15p
Contract Nonr4075 00, Proj. NR056 449

Unclassified report

Prepared for publication in Zeitschrift fur Kristallographie.

Descriptors: (*Borides, Crystal structure), (*Aluminum compounds, Borides), (*Crystal structure, Borides), Carbon compounds, Phase studies, X-ray diffraction analysis, High-temperature research.

The aluminum-boron phase described as beta-AlB12 was shown to consist of two crystallographically related, intergrown phases with the bulk stoichiometry of C2Al3B48. One phase (A) was orthorhombic with a = 12.34A, b = 12.631A and c = 5.08A and space group Cmma or C2ma. The other phase (B) was also orthorhombic with a = 6.17, b = 12.631 and c = 10.161 and space group Ammm, A222 or A2mm. Twinning was always present and occurred across both (110) faces. Occasionally, an unusual type of twinning appeared in which the a and b axes of both phases were parallel. This was interpreted as evidence of a disproportionation from a single high temperature phase. This was verified experimentally. The high temperature phase (C) was tetragonal with a = 8.82A, b = 5.09A and space group P4/nmm, P4/n or P4 sub 2/n. The transformation which is reversible was gradual and complete at about 850C. (Author)

AD-601 712 Div. 25, 8
OTS Price $1.00

General Electric Co., Syracuse, N. Y.
SEMICONDUCTOR LASER AMPLIFIER TECHNIQUES (SEMLAM).
May 64, 37p
Contract AF30 602 3111, Proj. 4506, Task 450602
RADC TDR64 148

Unclassified report

Descriptors: (*Lasers, Semiconductors), (*Diodes (Semiconductor), Gases), Design, Tests, Silicon compounds, Oxides, Coatings, Oscillators, Oxygen, Amplifiers, Transmission lines, Cryogenics, Pulse generators, Gallium compounds, Arsenides, Diodes, Tungsten.

This report contains information concerning the work of the third quarter. Preliminary tests were started on the over-all amplifier system which includes an oxygen gas laser as an oscillator and GaAs laser diodes as an amplifier with the associated optical components and cryogenic dewar. The emphasis is to construct pulsed and CW GaAs laser diodes with SiO anti-reflection coatings. (Author)

AD-601 726 Div. 25, 14
OTS Price $8.10

Pennsylvania Univ., Philadelphia.
STATISTICAL MECHANICS AND PHASE TRANSITIONS OF THE HEISENBERG ANTIFERROMAGNET.
Technical rept. no. 15
by F. Burr Anderson and Herbert B. Callen. Apr 64, 89p
Contract Nonr551 36

Unclassified report

The crystal system described by the structural space group D(14) sub 4h is considered. The first Brillouin zone for this structure was constructed and analyzed at points of high symmetry. Wave vector groups and character tables for these prints were obtained. The character systems developed may be used for general theoretical band structure calculations applied to materials such as stannic oxide and rutile which display this space group. In order to illustrate the results obtained, the symmetry analysis was utilized in the construction of free electron wave functions and energy bands along axes of the zone. (Author)

AD-601 800 Div. 25
OTS Price $2.50

New York State Coll. of Ceramics, Alfred Univ.
STUDY OF PHOTOCONDUCTIVITY IN POLYCRYSTALLINE CADMIUM TELLURIDE.
Doctoral thesis,
by George Thompson Lewis. May 64,. 105p
Contract Nonr1503 01, Proj. NR015 215

Unclassified report

Descriptors: (*Semiconductors, Photoconductivity), (*Photoconductivity, Cadmium alloys), (*Cadmium alloys, Tellurium alloys), Crystals, Material forming, Infrared radiation, Light transmission, Resistance (Electrical), Atomic energy levels, Mathematical models.

Polycrystalline samples of cadmium telluride were hot pressed from high purity materials over a range of temperatures at 3000 and 30,000 psi. Studies of the specimens were made in terms of their photoconducting properties, infrared transmission, resistivity, and carrier lifetimes. All samples possessed photoconductivity peak values which fell slightly below the band gap value of 1.5 eV reported for single crystal CdTe. Two low energy trapping levels were identified from the resistivity plots which correspond in energy to those identified with the single crystals. Carrier lifetimes showed a general increase with increasing pressing temperature and also pointed to the contribution of trapping to the band model. High pressure formed CdTe materials were found to approach single crystal properties for photoconductor and infrared transmission applications. (Author)

AD-601 803 Div. 25
OTS Price $5.60

Maryland Univ., College Park.
RELATIVISTIC DIRECT INTERACTION THEORIES.
Doctoral thesis,
by R. Fong. Jul 63. 51p MUP TR322
Grant AF AFOSR62 361
NP 13890

Unclassified report

Descriptors: (*Relativity theory, Scattering), (*Hamiltonian, Field theory), Elastic scattering, Elementary particles, N-body problem, S-matrix, Algebras, Group (Mathematics), Transformations (Mathematics), Mapping (Transformations), Functional analysis, Quantum mechanics.

Direct interaction theories are examined for the viewpoint of relativistic scattering theory and the associated concept of asymptotic covariance. It is pointed out that with any two-particle Hamiltonian which has no bound states there can be associated a variety of representations of the Lie algebra of the inhomogeneous Lorentz group (IHLG). It is shown that the requirement of asymptotic covariance ensures both the covariance of the S-matrix and the existence of a unique representation of the IHLG to be associated with a relativistic two-particle system. The connection between the Lie algebra, the covariant form of the S-matrix, and the uniqueness of K, the generator of pure Lorentz transformations, is thereby clarified. The extension of these considerations to include bound states and production processes is made. The two-particle form of H given by Bakamjian and Thomas is shown to satisfy asymptotic covariance and, moreover, to be the most general form of interest from the viewpoint of relativistic scattering theory, thereby including as a special case a form of H suggested by Sudarshan. (Author)

AD-601 806 Div. 25
OTS Price $0.50

Aerospace Corp., Los Angeles, Calif.
STRAIN-DISPLACEMENT RELATIONS IN LARGE DISPLACEMENT THEORY OF SHELLS.
by C. H. Tsao. 15 May 64, 15p TDR269 4230 30 4
Contract AF04 695 269
SSD TDR64 87

Unclassified report

Descriptors: (*Structural shells, Deformation), (*Elastic shells, Deformation), (*Strain (Mechanics), Mathematical analysis), Stresses, Elasticity, Functions, Differential equations, Transformations (Mathematics).

Strain-displacement relationships based on the large displacement theory of shells are derived. Formulas given in Novozhilov's book, Foundations of the Nonlinear Theory of Elasticity, are modified and improved. Sign conventions for the principal radii are clarified. The relationships given are for the general shell of any shape. These relationships can be readily transformed to obtain the formulas for special shells, such as spherical, conical, cylindrical or toroidal shells, for flat plates, and for curved and straight beams. (Author)

AD-601 822 Div. 25
OTS Price $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
FIRST AND SECOND NOTES ON DOUBLE REFRACTION ARTIFICIALLY PRODUCED IN REGULAR CRYSTALS.
by M. G. Wertheim. 28 May 64, 10p
RSIC 185; TT 64-11807

Unclassified report

Trans. of Academie des Sciences, Paris . Comptes Rendus (France) 1851, v. 33, p. 576-579; 1852, v. 36, p. 276-278 (pub. by Gauthier-Villars et Cie., Paris).

Descriptors: (*Crystals, Refraction), (*Refraction, Crystals), Crystal structure, Elasticity, Compressive properties, Optical phenomena, Polarization, France.

AD-601 830 Div. 25, 30
OTS Price $2.00

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH,
4 Jun 64, 75p
Contract AF19 628 500
ESD TDR64 48

Unclassified report

Descriptors: (*Solid state physics, Scientific research), Semiconductor devices, Lasers, Materials, Crystallography, Solids, Band spectrum, Spectroscopy, Magnetism, Resonance, Bibliographies.

Asurvey of solid state research is presented. Major areas covered are solid state devices, lasers, materials, band structure and spectroscopy of solids, and magnetism and resonance. A bibliography of reports by authors engaged in solid state research is also presented.

AD-601 766 Div. 25
OTS Price $0.75

University of Southern California, Los Angeles. Engineering Center.
RESEARCH IN PLASMA AND MAGNETOHYDRODYNAMICS. Final rept.
by Zohrab A. Kaprielian. Dec 63, 26p USCEC 103 101, EE35
Grant AF AFOSR188 63, Proj. 9768
AFOSR 64 1137

Unclassified report

Descriptors: (*Plasma physics, Analysis), (*Magnetohydrodynamics, Thermal radiation), (*Microwaves, Probes (Electromagnetic)), Plasma medium, Density, Measurement, Ionic current, Electron beams, Noise (Radio), Radiofrequency spectroscopy.

The research reported involves theoretical and experimental work in two major areas: plasma diagnostics, and measurements of thermal radiation from a highly ionized current carrying plasma. The results of these investigations were discussed in publications and technical reports and are reviewed briefly. (Author)

AD-601 778 Div. 25, 9
OTS Price $0.50

Aerospace Information Div., Washington, D. C.
INVESTIGATION OF HEAT AND MASS TRANSFER IN THE EVAPORATION OF LIQUID IN A FORCED GAS STREAM.
by G. T. Sergeev. [1964], 15p
AID T64 29; TT 64 11802

Unclassified report

Trans. of paper presented at the Conference on Heat and Mass [Transfer] Minsk p. 1-10 [Tezisy Dokladov i Soobshchenii na Soveshchanii po Teplo i Massoobmenu] 1961 [Moscow].

Descriptors: (*Heat transfer, Evaporation), (*Evaporation, Heat transfer), Liquids, Solids, Surface area, Gas flow, Wind tunnels, Porous materials, Phase studies, Heat transfer coefficients, USSR.

This report presents results of an experimental study of the mechanism of heat and mass transfer in the interaction of fluid and moist bodies with a gas stream. In the first series of experiments, evaporation of water, acetone, benzene, and butanol from an exposed surface was investigated. In the second series of experiments, heat and mass exchange were investigated under the same external conditions in the evaporation of water from a capillary-porous body, and heat exchange was investigated in a capillary-porous dry body. Some of the results of the completed experimental study are the following: (1) The heat exchange coefficients in evaporation are numerically higher than the heat exchange coefficients of the dry body under other-wise equal conditions; and (2) the processes of heat and mass exchange in evaporation from the surface of a capillary-porous body and from an exposed liquid surface are not analogous.

AD-601 788 Div. 25
OTS Price $14.50

Electronic Properties Information Center, Culver City, Calif.
SILICON, DATA SHEETS.
by M. Neuberger. May 64, 215p DS-137
Contract AF33 615 1235, Proj. 7381, Task 738103

Unclassified report

Descriptors: (*Silicon, Physical properties), Electrical properties, Films, Experimental data, Absorption, Dielectric properties, Hall effect, Tables, Diffusion, Work functions, Impurities, Piezoelectric effect, Thermal conductivity, Crystallography, Thermoelectricity, Magnetic properties, Electronics, Single crystals, Life expectancy, Semiconductors, Optical properties.

These data sheets present a compilation of a wide range of electrical, optical and energy values for pure and variously-doped silicon in bulk and film form. Electrical properties include conductivity, resistivity, dielectric constant, Hall coefficient, mobility, lifetime, thermoelectric and thermomagnetic. Emission data has been broken down into the varied electron and photon emissions which result from application of energy in the electromagnetic spectrum. Energy data include energy bands, energy gap and energy levels for variously-doped silicon, as well as, effective mass tables, work function, carrier diffusion and cross sections. The optical properties include absorption, reflection and refractive index. Other magnetic data and irradiation effects are included, as well as, several bordering physical phenomena such as piezoelectric properties, Debye temperature and thermal conductivity. Each property is compiled over the widest possible range of parameters from references obtained in a thorough literature search. A short crystallographic summary has been added. (Author)

AD-601 793 Div. 25
OTS Price $1.25

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
THE (n,2n) REACTION ON DEUTERIUM.
by Dale R. Koehler. 22 Apr 64, 46p
Proj. 1A010501B010
AMC-RA RR TR64 4

Unclassified report

Descriptors: (*Deuterium, Nuclear reactions), (*Neutron reactions, Perturbation theory), Protons, Nuclear cross sections, Hamiltonian, Nucleons, Potential scattering, Wave functions.

The D(n,p)2n reaction is treated in a direct interaction framework wherein the phenomenological nucleon-nucleon potentials of Gammel and Thaler are used to describe the perturbation interactions. Tensor forces as well as central forces are included and final state interactions among the particles is considered. The final state is pictured as a continuum deuteron plus free neutron or as a continuum dineutron plus free proton. To the extent that this picture is accurate, it is found that the main contributions to the cross section are supplied by the doublet to doublet transitions. The calculations furthermore suggest a best choice for the triplet even parity central potential. A comparison with the experimental results of Ilakovac and co-workers at 14.4 MeV is presented. (Author)

AD-601 798 Div. 25
OTS Price $2.25

Oklahoma State Univ., Stillwater Research Foundation.
SYMMETRY ANALYSIS OF THE STRUCTURAL SPACE GROUP D14 sub 4h.
Technical rept. no. 3
by Bill P. Clark and E. E. Kohnke. May 64, 92p
Contract Nonr2595 01, Proj. NR015 222

Unclassified report

Descriptors: (*Crystal lattices, Symmetry (Crystallography)), (*Brillouin zones, Analysis), (*Rutile, Crystal lattices), Crystal structure, Vector analysis, Wave functions, Tin compounds, Titanium compounds, Oxides, Atomic energy levels, Electrons.

Descriptors: (*Crystal lattice defects, Single crystals), (*Single crystals, Crystal lattice defects), Magnesium compounds, Oxides, Creep, Stresses, Crystal growth, Impurities, High-temperature research, Aging (Materials).

The paper distinguishes between the role of fresh, aged, grown-in and high-temperature dislocations in the initiation of plastic flow in magnesium oxide single crystals. Grown-in dislocations in commercial purity crystals cannot be moved even under very high stresses and play no role in initiating slip at room temperature. Plastic deformation originates from fresh dislocation loops injected into the crystal surface. Fresh dislocations, introduced by prestrain at room temperature, become aged at high temperatures resulting in dislocation locking and an increase in stress to reinitiate slip. Weak locking occurs above 600C and strong locking above 1200C. Dislocations are almost completely immobilized by heating to 1900C. Changes in dislocation configuration upon heating were studied by etch pit and electron transmission techniques. It is considered that the immobility of grown-in, aged and high temperature dislocations is due to a combination of impurity locking, configurational locking and the reduction of internal stresses. (Author)

AD-601 879 Div. 25
OTS Price $1.00

California Univ., La Jolla.
A CALCULATION OF THE PHONON FREQUENCIES IN SODIUM.
Technical rept. no. 18
by L. J. Sham. 9 Apr 64, 32p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Sodium, Phonons), (*Phonons, Frequency), Crystal lattices, Acoustic properties, Quantum mechanics, Ions, Electrons, Potential scattering, Neutron diffraction analysis, Atomic energy levels, Numerical analysis, Harmonic analysis.

The phonon spectrum of sodium is calculated in the harmonic approximation. The effective interaction between the ions is separated into direct two-body forces between bare ions and effective attraction due to the presence of conduction electrons. Careful treatment of the two phonon processes includes the calculation of the electron-phonon scattering based on the pseudo-potential method and the screening effects due to the interaction between electrons by the Hartree-Fock approximation with a screened exchange potential. Comparison of the results for sodium with neutron diffraction measurements and a previous calculation by Toya shows good agreement on the whole. (Author)

AD-601 907 Div. 25, 15
OTS Price $1.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
THE STATISTICAL FUNDAMENTALS OF IRREVERSIBLE THERMODYNAMICS.
by Hans Ziegler. 28 May 64, 56p
RSIC 187; TT 64 11810
Unclassified report

Trans. of Ingenieur-Archiv (West Germany) 1962, v. 31, no. 5, p. 317-342.

Descriptors: (*Thermodynamics, Irreversible processes), (*Statistical mechanics, Thermodynamics), Entropy, Heat, Energy, Statistical analysis, Differential equations, West Germany, Hamiltonian.

An attempt is made to generalize Onsager's theory to nonlinear processes. The statistical point of view is modified so that the principles of irreversible thermodynamics follow from it quite naturally, so that the fundamental theorems of reversible thermodynamics can be deduced from them as if they were special cases. It was shown that both Onsager's relations and their generalization readily follow from these considerations.

AD-601 918 Div. 25, 6, 8, 20
OTS Price $1.00

Martin Marietta Corp., Orlando, Fla.
EXCITATION AND DETECTION TECHNIQUES FOR MILLIMETER WAVE TRANSITIONS.
Quarterly progress rept. no. 7, 1 Jan-1 Apr 64,
by J. J. Gallagher, R. G. Strauch, and R. E. Cupp.
Jun 64, 35p OR-3959
Contract DA36 039sc90753, Proj. 1G6 22001A056
Unclassified report

Descriptors: (*Molecular beams, Millimeter waves), (*Millimeter waves, Molecular beams), Detection, Excitation, Resonance, Radiofrequency, Low frequency, Frequency stabilizers, Ammonia, Masers, Hydrogen compounds, Sulfides, Radioactive isotopes, Hyperfine structure, Nuclear structure.

Electric resonance experiments were performed on hydrogen sulfide at 168.7 gc and 216.4 gc. In addition, low frequency resonances were observed between Stark components of rotational states. A description is given of line width measurements which are being performed in a molecular beam absorption cell. Brief descriptions are given of related instrumentation and millimeter wave investigation. (Author)

AD-601 933 Div. 25
OTS Price $1.25

Duke Univ., Durham, N. C.
NUCLEAR MAGNETIC RESONANCE IN SOLID H2 AND D2 UNDER HIGH PRESSURES.
Technical rept. no. 3.
by Samuel A. Dickson and Horst Meyer. 1964, 47p
Contract Nonr1181 12
Unclassified report

Descriptors: (*Solidified gases, Nuclear magnetic resonance), (*Hydrogen, Nuclear magnetic resonance), (*Deuterium, Nuclear magnetic resonance), Phase studies, Transition temperature, Density, Dipole moments, Crystal lattices, X-ray diffraction analysis, Neutron diffraction analysis, High-pressure research.

Nuclear magnetic resonance data are presented for solid H2 and D2 between 1.5 and 4.2K and at pressures up to 5500 atm. For solid hydrogen, the ortho-para conversion, the transition temperature from the state of free rotation to that of hindered rotation and the line-width and second moment above the transition temp. was measured as a function of density and ortho concentration. The results are compared with other experimental evidence and with theoretical expectations. The second moment for both H2 and D2 (the latter with an ortho concentration of 0.67) is compared to that calculated for dipole-dipole interaction in a rigid lattice having the structure and dimension determined from x-ray and neutron data. The experimental second moments are found to be larger than the calculated ones and the discrepancy is discussed. (Author)

Division 25 - PHYSICS

AD-601 836 Div. 25, 14, 30
OTS Price $2.75

Spectrolab, Inc., North Hollywood, Calif.
RESEARCH ON THE DEVELOPMENT OF ULTRA NARROW BAND FILTERS FOR OPTICAL AND SPECTROPHOTOMETRIC USE.
Rept. for 1 Jan 59-30 Dec 61,
by Leopold Cann, Samuel Holmes, Noel Bowman, and Richard Mizrahi. May 64, 141p
Contract AF33 616 6237, Proj. 0 7 7360, Task 73602
ASD TDR63 523
Unclassified report

Descriptors: (*Optical filters, Narrowband), (*Ultraviolet filters, Feasibility studies), (*Infrared filters, Feasibility studies), Infrared films, Mica, Crystallography, Rare earths, Spectrophotometers, Interference.

Investigations carried out by Spectrolab on the research and development of ultra narrow band filters for optical and spectrophotometric use are described. Filters with bandwidths of approximately 0.5 Angstroms were desired for the visible region. A theoretical study was made into the various types of light filters with respect to their possibilities as narrow band filters. Two approaches were considered for the development of very narrow band filters and some prototypes were successfully prepared. Once the filters were made, difficulties ensued in the measurement of their parameters. Several attempts were made to develop suitable techniques for such measurements. A method is described which is capable of giving a semi-qualitative evaluation of these filters. Further work in correlating theory and experiment is necessary in this area. An investigation was made regarding the feasibility of producing narrow band filters in the ultra violet and infrared regions. A materials investigation was conducted for appropriate film components in these regions. Satisfactory films have been produced in the 3000 to 4000 A region. Below this region the rare earths have demonstrated promising results but additional study and research is required. A variety of materials exist for the production of infrared interference filters but time and expense prohibited the preparation of narrow band filters in this region. (Author)

AD-601 840 Div. 25
OTS Price $0.50

California Univ., Los Angeles.
THE GLASS TRANSITION AND RATES OF CRYSTALLIZATION OF AMORPHOUS ZnCl2.
Technical rept. no. 3,
by A. Eisenberg and B. J. Hileman. 15 Jun 64, 12p
Contract Nonr233 87
Unclassified report

Descriptors: (*Zinc compounds, Chlorides), (*Crystallization, Zinc compounds), (*Glass, Transition temperature), Phase studies, Thermodynamics, Dilatometers.

The glass transition temperature of zinc chloride was determined by dilatometric and linear expansion coefficient methods, and the rate of crystallization was measured dilatometrically. Results are given in tabular and graphic form. (Author)

AD-601 847 Div. 25
OTS Price $0.50

California Univ., La Jolla.
FREE ENERGY OF THE ANTIFERROMAGNETIC LINEAR CHAIN.
Technical rept. no. 20,
by Robert B. Griffiths. 18 May 64, 11p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Antiferromagnetism Thermodynamics), Field theory, Atomic energy levels, Hamiltonian, Nuclear spins, Entropy.

Rigorous upper and lower bounds for the free energy of the antiferromagnetic Heisenberg linear chain are obtained from general convexity properties of the free energy. The lower bound is derived; the upper bound was obtained previously. Both are compared with the calculations of Bonner and Fisher for finite chains. (Author)

AD-601 855 Div. 25, 7, 8
OTS Price $3.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MICROWAVE RESEARCH INSTITUTE PROGRESS REPORT NO. 25.
Rept. for 1 Oct 63-31 Mar 64,
by Ernst Weber. 31 Mar 64, 159p PIBMRI 452 25 64
Grant AF AFOSR453 63, Proj. 4751
Unclassified report

Descriptors: (*Microwaves, Scientific research), Reports, Electromagnetic waves, Electromagnetism, Plasma physics, Electronics, Materials, Solid state physics, Magnetic properties, Microwave equipment, Circuits, Control systems, Data processing systems, Communication theory, Equations, Electrical networks.

Research report contributions are compiled under six descriptive subject headings: electromagnetics, plasma electrophysics and electronics, solid state and materials research, microwave circuits, network theory, and systems, communications, and control. As may be anticipated from the summary of activities given below, these headings may be supplemented from time to time with reports of additional phases of research in which various groups of participating faculty are engaged.

AD-601 858 Div. 25, 15
OTS Price $0.75

California Univ., La Jolla.
SPONTANEOUS MAGNETIZATION IN IDEALIZED FERROMAGNETS.
Technical rept. no. 19,
by Robert B. Griffiths. 28 Apr 64, 29p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Magnets, Materials), (*Ferromagnetism, Mathematical analysis), Magnetic fields, Thermodynamics, Crystal lattices, Magnetic moments, Momentum, Spin, Low temperature research, Density, Hamiltonian.

An attempt, not entirely successful, is made to clarify the relation between two definitions of spontaneous magnetization in a Heisenberg or Ising ferromagnet with short range interaction. One definition uses the average magnetization in the presence of an external magnetic field, the other the probability distribution of the magnetization in the absence of a field. In connection with the latter, the analog for magnetic systems of the monotone pressure-volume relation in a gas (computed in the canonical ensemble) is demonstrated. The analysis requires that the total z component of magnetization commute with the Hamiltonian. (Author)

AD-601 863 Div. 25
OTS Price $3.60

Honeywell Research Center, Hopkins, Minn.
DISLOCATION CONFIGURATIONS AND THE INITIATION OF YIELDING IN MAGNESIUM OXIDE.
Technical rept. no. 24,
by R. J. Stokes and C. H. Li. Jun 64, 39p HR 64 269
Contract Nonr4076 00, Proj. NR032 541
Unclassified report

assuming an optically thin gas and different absorption coefficient data are considered. Criteria for specifying air as optically thin or optically thick are included. The energy lost from the system by radiation is compared with the total energy of the system. (Author)

AD-602 014 Div. 25, 8, 30
OTS Price $8.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
FINAL REPORT. ELECTROMAGNETICS, PLASMA ELECTROPHYSICS AND ELECTRONICS, SOLID STATE AND MATERIALS RESEARCH, MICROWAVE CIRCUITS, NETWORK THEORY, AND SYSTEMS AND CONTROL.
Rept. for 15 Jul 55-15 Jul 56 and 1 May 62-30 Apr 63.
by John G. Truxal. 5 Aug 63, 91p, PIBMRI 1188 63
Contract AF18 600 1505; Grant AF AFOSR62 295
AFOSR 5249

Unclassified report

Descriptors: (*Microwaves, Scientific research), (*Abstracts, Scientific research), Research program administration, Reports, Electromagnetism, Plasma physics, Electronics, Solid state physics, Microwave networks, Materials, Networks, Communication theory, Control systems, Computers, Electronic equipment, Systems engineering, Wave guides.

AD-602 019 Div. 25, 8
OTS Price $0.75

Westinghouse Defense and Space Center, Baltimore, Md.
DEVELOPMENT OF MILLIMETER AND SUBMILLIMETER MASER DEVICES.
Interim technical rept. no. 4, 1 Feb-31 May 64.
by W. E. Hughes. 31 May 64, 21p WDSC 490D
Contract AF33 657 10472

Unclassified report

Descriptors: (*Masers, Materials), (*Paramagnetic resonance, Masers), Ions, Iron, Rutile, Zinc compounds, Tungstates, Manganese, Waveguides, Magnetic fields, Extremely high frequency, Bandwidth, Paramagnetic materials, Mechanical properties, Spin, Crystals.

A zero-magnetic-field maser was operated at a frequency of 81.3 gc with the iron ion in rutile, a zero-magnetic-field maser was operated at a frequency of 78 gc with the iron ion in zinc tungstate, and the first reported paramagnetic resonance absorption was observed at frequencies near 330 gc with the manganese ion Mn(3+) in rutile. Since the 330-gc paramagnetic resonance experiments were very crude, a more sophisticated system is being designed. (Author)

AD-602 022 Div. 25, 8
OTS Price $2.25

Stanford Electronics Labs., Stanford Univ., Calif.
TWO-STREAM INTERACTION IN GAPS AND HELICES.
Interim technical rept. for Oct 60-Oct 63
by George Lawrence Sackman. Jan 64, 86p
SEL 63 137, TR0307 1
Contract AF33 657 11144, Proj. 4036, Task 403602
AL TDR64 66

Unclassified report

Descriptors: (*Electron beams, Plasma medium), (*Plasma physics, Electron beams), Coupling circuits, Electromagnetic waves, Transmission lines, Helixes, Deflection coils, Electron guns, Space charges, Microwave amplifiers, Electronics, Theory, Experimental data.

This study considers certain systems composed of two electron beams, either in a gap or coupled to a slow-wave transmission line. The interaction of a single electron stream coupled to the fields of a resonant cavity is examined with particular attention to the effect of beam perveance on the apparent beam loading resistance. Experimental measurement verifies the existence of extrema in the maximum negative beam resistance as a function of the plasma transit angle, which is a normalized parameter proportional to perveance. (Author)

AD-602 035 Div. 25, 8
OTS Price $0.50

Microwave Lab., Stanford Univ., Calif.
FINAL PRECESSION ANGLES FOR PULSED FERRITE SAMPLES.
Technical rept.
by K. J. Harker. Apr 64, 18p ML 1149
Contract DA36 039AMC00041E, Proj. 3A99 21 001

Unclassified report

Descriptors: (*Microwave oscillators, Ferrites), (*Ferrites, Magnetic properties), Ferromagnetism, Electromagnetic pulses, Vector analysis, Thermodynamics.

A theoretical study was made of the transient motion of the magnetization vector in isotropic ferrite spheres during the application of pulsed magnetic fields at an angle to the dc saturating field. Results are presented which permit the determination of the final precession angle for (1) arbitrary pulse-rates and pulsing angles when the pulse is linear, and (2) arbitrary pulsing angles when the pulse is slowly rising and nonlinear. (Author)

AD-602 038 Div. 25
OTS Price $0.75

California Univ., La Jolla.
INSTABILITY IN THE QUANTUM HELICON DISPERSION RELATION.
Technical rept. no. 21,
by N. David Mermin and V. Celli. 17 Jun 64, 29p
Contract Nonr2216 11, Proj. NRO17 630

Unclassified report

Descriptors: (*Plasma medium, Stability), (*Quantum mechanics, Plasma medium), Plasma physics, Magnetic fields, Electromagnetic fields, Electron transitions, Excitation, Thermodynamics.

When a quantum gas in a magnetic field is treated with all electromagnetic interactions, at very low temperatures it becomes unstable against transverse excitations propagating in the direction of the field. This instability appears as a root of the quantum helicon dispersion relation in the upper half frequency plane. It is shown that the instability is due to the failure of the conventional Hartree ground state (in which the one electron states are the ordinary Landau ones) to minimize the ground state energy, when magnetic current-current interactions are retained along with the Coulomb interactions. A state was found giving a lower energy than the conventional one, in which transverse volume currents exist perpendicular to the magnetic field. Because, however, the magnetic coupling is very weak, the reduction in energy is unobservably small at any realistic field strengths or electronic densities. It is concluded that the instability does not lead to any measurable effects, and that for all practical purposes the conventional thermal equilibrium state can be regarded as stable. (Author)

AD-601 961 Div. 25, 2
OTS Price $3.00

Michigan Univ., Ann Arbor. Coll. of Engineering.
THE HYDROSTATIC PRESSURE EFFECT ON THE EPR SPECTRA OF Cr(3+) AND V(2+) IN SAPPHIRE.
Technical rept.,
by Alan F. Clark, Richard H. Sands, and Chihiro Kikuchi.
May 64, 178p ORA 06029 1T
Contract DA49 186AMC80x, Proj. 06029

Unclassified report

This report was also a dissertation submitted by the first author in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the University of Michigan, 1964.

Descriptors: (*Sapphires, Impurities), (*Chromium, Paramagnetic resonance), (*Vanadium, Paramagnetic resonance), Hydrostatic pressure, Ions, Electrons, Crystal lattices, Anisotropy, Masers, Lasers, Magnetic fields, Crystal structure, Solid state physics, Hamiltonian, Single crystals, Ruby.

The interaction of the Cr3+ and V2+ impurity ions with the alpha - Al2O3 crystal lattice was studied by observing the hydrostatic pressure dependence of their electron paramagnetic resonance spectra to 6000 atmospheres. A two sample comparison method was used in which two identical samples were placed in the X band microwave resonant cavity. One end of the cavity and one sample were subject to hydrostatic pressure. The changes in the spin Hamiltonian parameters were obtained by measuring the difference in the magnetic field required for the same resonant condition in each sample as a function of pressure. From this it was concluded that the ions occupy similar lattice sites, though possibly including the displacements proposed in the literature, and are subject to the same compressibility, comparable to that of the bulk compressibility. Comparison with the point charge model led to the conclusion that the point charge model was inadequate to predict the observed pressure changes. A molecular orbital calculation as a function of surrounding ion position and further experiments are suggested.

AD-601 967 Div. 25
OTS Price $2.60

Institute of Flight Structures, Columbia Univ., New York.
ESTIMATE OF ERRORS IN APPROXIMATE TEMPERATURE AND THERMAL-STRESS CALCULATIONS.
Technical rept. nos. 26 and 1,
by Bruno A. Boley. Jun 64, 29p CU 1 64ONR4259 07CE
Contracts Nonr226 20; Nonr4259 07

Unclassified report

Descriptors: (*Thermal conductivity, Mathematical analysis), (*Thermal stresses, Mathematical analysis), Melting, Theorems, Stresses, Beams (Structural), Surface properties, Metal plates, Elasticity, Plasticity, Heat transfer, Errors, Temperature.

After a general discussion of the estimate of errors in calculation of temperature and thermal stresses, a general theorem and a method for the construction of upper and lower bounds for the solution of three-dimensional heat-conduction problems is presented. Emphasis is placed on cases of moving boundaries, thus including problems of change of phase. Errors in stress calculations proper are then studied, with attention given to the fact that special difficulties are created by the existence of temperatures which cause zero stress. Elastic beams and plates are analyzed, and it is found that the maximum stress cannot exceed the quantity 4/3 alpha ET where T is the maximum difference in temperature in the body and the relevance of this fact in error estimates is noted. Simplifications for symmetrical and antisymmetrical temperature distributions are given. Elastic-perfectly plastic beams and plates are examined in the last section of the paper. (Author)

AD-601 979 Div. 25
OTS Price $1.60

Michigan Univ., Ann Arbor. Coll. of Literature, Science, and the Arts.
DIFFERENTIAL AND TOTAL CROSS SECTION FOR THE REACTION p + p YIELDS d + POSITIVE PION.
Technical rept. no. 16,
by O. E. Overseth, R. M. Heinz, L. W. Jones, M. J. Longo, and D. E. Pellett. Jun 64, 13p ORA 03106 16T
Contract Nonr1224 23

Unclassified report

Descriptors: (*Proton reactions, Nuclear cross sections), (*Nuclear cross sections, Proton reactions), Proton beams, Nuclear reactions, Deuterons, Pions, Nuclear scattering, Scintillation counters.

The differential cross section for the reaction p + p yields d + positive pion was measured with scintillation counters for incident proton kinetic energies of 1.3, 1.5, 1.7, 2.0, 2.5, and 3.8 Bev, using the external proton beam of the Cosmotron. Values of d sigma/d omega with a total uncertainty of ±11% are given for barycentric deuteron angles, Theta, for $O < or = \cos \text{theta} < or = -0.97$ in small intervals of cos theta. The primary interest, in this reaction is that it is one of the few two body reactions in high energy particle physics, and therefore might provide both a stimulus and a test for dynamical theories of particle interactions. (Author)

AD-601 980 Div. 25, 8
OTS Price $0.75

Harry Diamond Labs., Washington, D. C.
FERROMAGNETIC RESONANCE EXPERIMENTS ON CRYSTAL-ORIENTED HEXAGONAL FERRITES.
by Walter Viehmann. 8 May 64, 27p
Projs. DA1P523801A300 and 96300
HDL TR1227

Unclassified report

Descriptors: (*Microwave equipment, Ferrites), (*Ferromagnetism, Magnetic resonance), (*Ferrites, Magnetic resonance), Cobalt alloys, Titanium alloys, Crystal structure, Anisotropy, Theory, Ferromagnetic materials, Preparation, Magnetic properties.

Ferromagnetic resonance was measured on crystal-oriented samples of the Co delta Ti delta M series prepared by means of topotactical reactions. Samples with a high degree of alignment were obtained with anisotropies ranging from +6000 oe (uniaxial) to -4900 oe (planar). Resonance conditions can in general be described by existing theories, developed for single crystals of hexagonal crystal structure. Line width measurements on these materials are also viewed in the light of existing theories. (Author)

AD-601 998 Div. 25, 9
OTS Price $0.50

Harry Diamond Labs., Washington, D. C.
THERMAL RADIATION FROM HIGH-TEMPERATURE AIR.
by Harry J. Davis. 12 May 64, 18p
Projs. 1P52380A301, 36531
HDL TR 1225

Unclassified report

Descriptors: (*Aerodynamic heating, Thermal radiation), (*Thermal radiation, Air), (*Heat transfer, Thermal radiation), One-dimensional flow, Blackbody radiation, Thermodynamics, Enthalpy, Mathematical analysis, Inequalities.

Thermal flux radiated from an isothermal slab of air is calculated, assuming one-dimensional radiation flow for a wide range of gas temperatures and densities and using the latest absorption coefficient data available. The effects of

A theoretical analysis of the axisymmetric elastic deformations and stresses in a circular cylindrical shell internally stiffened by inverted channel frames under uniform external pressure loading is presented. The solution is based on the use of edge coefficients for plate and shell elements to determine the edge forces and moments arising at the common jucture of these elements. Equations are given for computing numerically the stresses in the elements of the composite structure once the edge forces and moments are determined. (Author)

AD-602 105 Div. 25
OTS Price $5.60

Virginia Univ., Charlottesville.
THE EQUILIBRIUM OF CRYSTAL SURFACES.
by N. Cabrera. 1964, 58p
Contract Nonr474 05

Unclassified report

Descriptors: (*Metallic crystals, Surface properties), Crystals, Surface area, Vapors, Energy, Anisotropy, Statics, Stresses, Thermodynamics, Stability, Surface tension, Crystal lattices, Crystal structure, Equations, Mathematical analysis, Crystallography.

The purpose of this paper is to review the basic principles underlying the theory of crystal surfaces, giving particular attention to the phenomenological thermodynamic point of view. The basic equation for the equilibrium of crystal surfaces is discussed from a general viewpoint. It will be emphasized that there are two main differences with respect to the situation in the case of fluid surfaces: a) The surface energy is anisotropic in a crystal and isotropic in a fluid b) In crystals the existence of surface stresses and connected volume stress must be taken in account. Macroscopic equilibrium will be considered. In it will be discussed the two main classical problems, faceting and equilibrium shape of small crystals. Microscopic equilibrium is also considered.

AD-602 128 Div. 25, 7
OTS Price $0.50

American Meteorological Society, Boston, Mass.
A HIGH-POWER ELECTRIC SPARK IN AIR AT ATMOSPHERIC PRESSURE,
by I. S. Abramson and I. S. Marshak. Dec 63, 18p
AmMetSoc T-R-414
Contract AF19 604 6113
TT 64 11821

Unclassified report

O Moshchnoi Elektricheskoi Iskre v Vozdukhe pri Atmosfernom Davlenii, trans. of Zhurnal Tekhnicheskoi Zhurnal (USSR) 1942, v. 12, no. 10, p. 632-639.

Descriptors: (*Electrical discharges, Energy), (*Sparks, Electrical properties), Electric arcs, Voltage, Electric currents, Electrodes, Gas ionization, Plasma physics, USSR.

Investigation of a spark, energized by a voltage source capable of supplying currents of several hundred amperes for a period of the order of 10 to the minus 8th power sec, showed that the voltage drop on the spark for such currents is considerably greater than the potential difference in a normal arc. By the end of the voltage dip, the diameter of the channel, determined by the Kerr cell, is independent of the current, at least in first approximation. There is a certain critical current density in the spark channel for the given potential difference between the electrodes. The quantity of energy liberated in the spark gap can be very large, owing to saturation. A discharge in metal-wire vapor is akin to a discharge with high current density in the last stage of the spark. (Author)

AD-602 137 Div. 25, 17
OTS Price $2.25

Torino Univ. (Italy).
ON THE INFLUENCE OF SMALL AMOUNTS OF IMPURITIES ON RECRYSTALLIZATION AND GRAIN GROWTH OF HIGH PURITY IRON. NOTE III. EFFECT OF BORON ON RECRYSTALLIZATION AND EFFECT OF IMPURITIES ON NORMAL AND ANOMALOUS GRAIN GROWTH.
Final technical rept. for 1 Oct 62-29 Feb 64,
by G. Venturello, F. Bonaccorso, G. Della Gatta, and A. Lucci. Mar 64, 97p
Contract DA91 591EUC2708

Unclassified report

Descriptors: (*Iron, Recrystallization), (*Recrystallization, Impurities), (*Boron, Metallurgy), Italy, Heat treatment, Purfication, Grain structures (Metallurgy), Crystal lattice defects, Silicon, Aluminum compounds, Oxides, Recovery, Chemical precipitation, Cold-working, Phase studies, Microstructure, Deformation.

In Part I the results obtained led to conclude that boron is insoluble in very pure alpha iron. Research on the problem of the conditions of boron in pure iron both by making a theoretical verification based on thermodynamic considerations and by internal friction methods was extended. The first results confirm a nearly complete interstitial insolubility of boron in very pure iron. In a series of iron specimens silicon contaminations were observed, caused by the impurities of silica still present in the purest commercial sintered alumina refractories used. It was found that a 0.16 wt. % content of silicon delays the 50% recovery and recrystallization temperature by 110C and 40C respectively. The Part II of this report concerns the effect of precipitated impurities and of medium and low amounts of strain on grain growth. Specimens of high-purity iron, with or without precipitated oxides, and of normal and deoxidized Armco iron were used. It was confirmed that the presence of precipitates stops grain growth up to a higher temperature, above which grain size increases suddenly. Medium amounts of strain (25-40%) produce an additional driving force that enhances grain growth. In the case of specimens cold-worked by low amounts (3-6%) grain growth temperature is raised.

AD-602 146 Div. 25, 4
OTS Price $1.60

American Meteorological Society, Boston, Mass.
IMPROVED EXPRESSIONS FOR THE MATRIX ELEMENTS OF OPERATORS OF SPIN-DEPENDENT INTERACTIONS.
by A. P. Yutsis, R. S., Dagis, Ya. I. Vizbaryate, and S. A. Zhvironaite. Sep 63, 20p AmMetSoc T-R-399
Contract AF19 604 6113
TT 64 19342

Unclassified report

Utochnenie Vyrazhenii dlya Matrichnykh Elementov Operatorov Spinovogo Vzaimodeistviya, trans, of Akademiya Nauk Litovskoi SSR Vilna . Trudy. Ser iya B, 1961, no. 3(26) p. 53-66.

Descriptors: (*Atomic spectroscopy, Quantum mechanics), (*Atomic orbitals, Tables), Electrons, Spin, Energy, Matrix algebra, Integrals, Operators (Mathematics), USSR.

Inaccuracies are indicated in the expressions for two-electron matrix elements of spin interaction in previous works. Definitions of radial integrals are presented which express the energy of these interactions between the electrons in an atom, and establish their characteristics. Computations were performed for a more precise definition of previous results. Tables are presented which can be employed with those in the previous works to find the correct expressions for the matrix elements of the energy of spin interactions for a number of configurations. (Author)

AD-602 039 Div. 25
OTS Price $1.25

California Univ., La Jolla.
LONG WAVELENGTH OSCILLATIONS OF A QUANTUM PLASMA IN A UNIFORM MAGNETIC FIELD II.
Technical rept. no. 22
by Vittorio Celli and N. David Mermin. 17 Jun 64, 42p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Plasma oscillations, Quantum mechanics), (*Magnetohydrodynamics, Equations), Electrons, Gases, Oscillation, Frequency, Electrostatics, Numerical analysis, Matrix algebra, Magnetic fields, Propagation, Cyclotron resonance phenomena.

The self-sustained oscillations of a quantum mechanical electron gas in a uniform magnetic field are discussed in the time-dependent Hartree approximation, or random phase approximation. The full electromagnetic interaction between electrons is taken into account, and spin effects are included. The resulting dispersion relation reduces to the Appleton-Hartree equation of classical magnetohydrodynamics in the limit of long wavelengths. It is found that this classical equation holds even for a highly degenerate electron gas or for magnetic fields so strong that only a few Landau oscillator levels are appreciably occupied. The validity of long wavelength expansions is discussed for the various normal modes, particular attention being given to the low frequency transverse mode, a particular case of which is the helicon or whistler. It is also shown that the normal modes with appreciable longitudinal currents are correctly described over a wide range of wavelengths by the electrostatic approximation, in which only Coulomb forces between electrons are retained. (Author)

AD-602 040 Div. 25
OTS Price $0.75

California Univ., La Jolla.
THE INHOMOGENEOUS ELECTRON GAS.
Technical rept. no. 23
by P. Hohenberg and W. Kohn. 17 Jun 64, 25p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Plasma medium, Quantum mechanics), Electrons, Gases, Electron transitions, Polarization, Density, Plasma oscillations, Functional analysis, Numerical analysis.

AD-602 044 Div. 25, 4
OTS Price $1.25

California Univ., Riverside.
BEHAVIOR OF SOLIDS UNDER PRESSURE.
Annual progress rept.
by A. W. Lawson. Jul 64, 50p
Contract Nonr1842 05, Proj. NR017 314
Unclassified report

Descriptors: (*High-pressure research, Abstracts), Solid state physics, Silver compounds, Mercury compounds, Iodides, Vanadium compounds, Oxides, Single crystals, Powders, Transition temperatures, Electrical conductance, Magnetic resonance.

The pressure dependence of the electrical conductivity of Ag2HgI4 was investigated. The resistance of VO2 through the semiconductor-to-metal transition was measured as a function of hydrostatic pressure. The transition was studied in pure and partially hydrated single crystals of VO2 and in powdered VO2. Finally, a high pressure microwave cavity for use in magnetic resonance was investigated. A sapphire cone terminated at the large end with a metallic sample served simultaneously as a pressure seal and the resonant structure for a 1 cm magnetic resonance spectrometer.

AD-602 058 Div. 25, 30
OTS Price $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
PURELY OPTICAL METHOD FOR DETERMINING INTERNAL STRESSES OCCURRING IN STRUCTURES.
by Henry Favre. 15 Jun 64, 17p
RSIC 189; TT 64-11813
Unclassified report

Trans. of Schweizerische Bauzeitung, 1927, v. 90, no. 23, p. 291-294.

Descriptors: (*Stresses, Optical analysis), (*Photoelasticity, Structures), Elasticity, Deformation, Polarization, Light, Flat plate models, Equations, Optics, Switzerland.

Two basic relations regarding induced birefringence of transparent flat plates subject to two dimensional action from stresses is given.

AD-602 062 Div. 25, 30
OTS Price $0.50

Redstone Scientific Information Center, Redstone Arsenal Ala.
COMPLETE DETERMINATION OF THE PLANAR STRESS CONDITION BY THE AXIAL PATTERN METHOD.
by R. Hiltscher. 8 May 64, 16p
RSIC 180; TT 64 11817
Unclassified report

Trans. of Forschung auf dem Gebiete des Ingenieurwesens (Germany) 1944, v. 15, no. 1, p. 12-17.

Descriptors: (*Stresses, Optical analysis), (*Photoelasticity, Theory), Shear stresses, Models (Simulations), Refractive index, Light, Polarization, Optics, Equations, West Germany.

The optical-stress procedure derived here allows: (1) A quantitative assessment of the planar stress condition at a point in the model. This can be done at first glance, whereupon the points and areas of particular interest are selected with little effort; e.g., the sections under tensile stress in a reinforced concrete structure. (2) An accurate point-by-point measurement of the planar stress condition according to magnitude and direction of the principal normal stresses and the maximum shearing stress. The method is based solely on the gaging of isochromatic fringe patterns, which are obtained by means of simple equipment. The strong point of the new method of analysis is that it is especially applicable to those places in the model which exhibit few isochromatic fringes, i.e., a low shearing stress gradient. It thus provides an excellent complement to the graphic evaluation methods which become inaccurate here. (Author)

AD-602 076 Div. 25
OTS Price $0.75

David Taylor Model Basin, Washington, D. C.
AXISYMMETRIC ELASTIC STRESSES IN CIRCULAR CYLINDRICAL SHELLS STIFFENED BY INTERNAL CHANNEL SECTIONS AND SUBJECTED TO UNIFORM EXTERNAL PRESSURE LOADING.
Research and development rept..
by Kenneth Hom. May 64, 29p
Proj. S F013 03 02
DTMB 1811
Unclassified report

Descriptors: (*Structural shells, Stresses), (*Stiffened cylinders, Stresses), Cylindrical bodies, Elasticity, Deformation, Hydrostatic pressure, Loading (Mechanics), Moments, Numerical analysis.

AD-602 188 Div. 25, 4, 8
OTS Price $0.50

American Meteorological Society, Boston, Mass.
SEMICONDUCTOR PROPERTIES OF ORGANIC DYES.
II. TRYPAFLAVINE.
by A. T. Vartanyan. Aug 63, 18p AmMetSoc T-R-403
Contract AF19 604 6113
TT 64 11828

Unclassified report

Poluprovodnikovye Svoistva Organicheskikh Krasitelei.
II. Tripaflavin, trans. of Zhurnal Fizicheskoi Khimii (USSR) 1950, v. 24, no. 11, p. 1361-1370.

Descriptors: (*Semiconductors, Organic materials), (*Dyes, Semiconductors), (*Anthoxanthin pigments, Photoconductivity), Acridines, Chlorides, Films, Photoelectric effect, Absorption spectrum, Oxygen, Photochemistry Oxidation, USSR.

When a solid film of trypaflavine is illuminated in vacuum, a photocurrent can be observed which is directly proportional to the light intensity and the applied field strength. The inertia of the photocurrent during illumination and after the light has been extinguished is of the order of one minute. For films several tens of microns thick, photoconductivity can be seen throughout the absorption band. The relative photocurrent yield becomes maximum at 500 millimicrons and drops to zero in the region from 500-600 millimicrons. The photocurrent increases exponentially with increasing temperature. The photoconductivity of the film is greater in oxygen than that in a vacuum. The effect of oxygen on the film is a function of the wavelength of the exciting light: for long waves photosorption predominates, accompanied by an increase in the photocurrent, while for short waves, in addition to photosorption, there is a photochemical reaction accompanied by attenuation of the photocurrent and, in the case of prolonged illumination, it is accomplished by irreversible photo-oxidation of the dye. (Author)

AD-602 191 Div. 25, 17
OTS Price $0.50

American Meteorological Society, Boston, Mass.
NEW FORMULAS FOR CALCULATING CERTAIN PHYSICAL PROPERTIES OF SUBSTANCES.
by B. N. Oshcherin. Sep 63, 18p AmMetSoc T-R-410
Contract AF19 604 6113
TT 64 11832

Unclassified report

Novye Formuly dlya Rascheta Nekotorykh Fizicheskikh Kharakteristik Veshchestv, trans. of Poroshkovaya Metallurgiya (USSR) 1962 [v. 2] no. 6, p. 3-11.

Descriptors: (*Physical properties, Metals), (*Equations of state, Metals), (*Metals, Temperature), Atomic properties, Compressive properties, Sound, Propagation, Thermodynamics, Melting, Boiling, Complex compounds, Crystals, Numerical analysis, Differential equations.

Topics discussed are: Basic premises and relationships; Compressibility; Rate of propagation of longitudinal sound waves; The microscopic sense of Gruneisen's law; Correlation of heat capacity with constant pressure and volume; Characteristic frequencies, temperatures, and energies; Melting and boiling; Application of the formulas to complex substances; and Properties of hypothetical crystals of certain simple substances.

AD-602 208 Div. 25, 14
OTS Price $0.50

Uppsala Univ. (Sweden).
EVOLUTION OF MOLECULAR SYSTEMS AND THE SEPARATION OF ELECTRONIC AND NUCLEAR MOTIONS.
Scientific rept. no. 8
by David Micha. 15 Mar 64, 16p
Contract AF61 052 701
ARL 64 134

Unclassified report

Descriptors: (*Molecular structure, Quantum mechanics), (*Quantum mechanics, Molecular structure), Electrons, Nuclei, Motion, Perturbation theory, Numerical analysis, Wave functions, Hamiltonian, Electron transitions.

A time-dependent approach to the study of molecular systems is used to analyze the interaction between the electronic and nuclear motions. The set of coupled evolution equations for the nuclei, resulting from this treatment, is solved in a first order perturbation approximation to obtain the decoupling of electronic and nuclear motions and to give conditions for its validity. A comparison is made with an adiabatic approximation treatment of the evolution equations and with the Born-Oppenheimer approximation, paying attention to the initial suppositions and to the restrictions in the different cases. (Author)

AD-602 209 Div. 25
OTS Price $0.50

Naval Underwater Sound Reference Lab., Orlando, Fla.
EXPERIMENTAL STUDY OF ACOUSTIC DIFFRACTION GRATINGS,
by G. A. Sabin. 13 Jul 64, 8p
USRL RR75

Unclassified report

Descriptors: (*Underwater sound, Scattering), (*Diffraction gratings, Underwater sound), Underwater sound equipment, Wire, Copper, Sound transmission, Acoustics, Optics.

Acoustic diffraction gratings immersed in water were studied experimentally at megacycle frequencies. Directivity patterns show the diffracted beams of a family of copper wire gratings. The usual diffraction grating formula of optics predicts accurately the diffraction angles for the diffracted beams but fails to predict their intensity levels. It is concluded that the sound scattered by the wires contributes significantly, constructively or destructively, depending on phase relations, to the sound diffracted by the slits. (Author)

AD-602 212 Div. 25, 17
OTS Price $2.50

Stanford Electronics Labs., Stanford Univ., Calif.
OPTICAL SECOND-HARMONIC GENERATION IN SEMICONDUCTOR ALLOYS.
Interim rept. for Jan 62-Dec 63,
by R. A. Soref. Dec 63, 102p SEL TR0556 8, SEL-63-145
Contract AF33 657 11144; Grant NsG331,Proj. 4036, Task 403602
AL TDR64 78

Unclassified report

Descriptors: (*Semiconductors, Optical properties), Absorption spectrum, Crystal lattices, Zinc compounds, Sulfides, Cadmium compounds, Selenides, Single crystals, Gallium compounds, Light, Electromagnetic waves, Quantum mechanics, Photons, Cadmium alloys, Lasers, Polarization, Arsenides, Propagation, Wave functions, Gallium alloys, Crystal structure, Mathematical models, Tellurides, Phosphides.

AD-602 147 Div. 25, 4
OTS Price $0.50

American Meterorological Society, Boston, Mass.
CONFIGURATION INTERACTION IN ATOMIC SPECIES OF BERYILLIUM TYPE.
by A. P. Yutsis and V. I. Kavetskis. Aug 63, 14p
AmMetSoc T-R-405
Contract AF19 604 6113
TT 64 11819

Unclassified report

Vzaimodeistvie Konfiguratsii v Atomakh Tipa Berillya, trans. of Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (USSR) 1951, v. 21, no. 10, p. 1139-1145.

Descriptors: (*Atomic orbitals, Wave functions), (*Beryllium, Atomic orbitals), (*Alkali metals, Stability), Lithium, Boron, Carbon, Nitrogen, Oxygen, Ions, Atomic energy levels, Matrix algebra, USSR.

A calculation was made of the effect of configuration interaction on the energy of the ground configuration of the isoelectronic series Li(-), Be, B(+), C(2+), N(3+), and O(4+) and the calculated energies were compared experimental data. The stability of negative ions of alkali metals was examined. (Author)

AD-602 150 Div. 25, 4
OTS Price $0.50

Bausch and Lomb, Inc., Rochester, N. Y.
STUDY OF NON-OXIDE MATERIALS WITH DEFECT STRUCTURES.
Semi-annual technical rept. for period ending 30 Apr 64,
by D. A. Buckner and N. J. Kreidl. 30 Apr 64, 9p
Contract Nonr3632 00, Proj. NR015 501 10 4 62, ARPA Order 269

Unclassified report

Descriptors: (*Fluorides, Crystals), (*Crystal lattice defects, Fluorides), Physical properties, Mechanical properties, Optical properties, Electrical properties, High-temperature research, High-pressure research, Hot working.

The purpose of the work is to evaluate known and prepare new fluorides expected to possess controllable gross defects and determine their physical properties, especially as a function of the amount and nature of the defect and to perform an intensive study of the mechanical, optical and electrical properties of polycrystalline aggregates under high pressure and temperature conditions.

AD-602 170 Div. 25, 2
OTS Price $9.10

Ludwig-Maximilians-Univ., Munich (West Germany).
INVESTIGATION OF THE INFRARED EMISSION SPECTRUM OF THE ATMOSPHERE AND EARTH.
Final rept.,
by Hans-Jurgen Bolle, Gunter Kuers, Fritz Moller, and Heinrich Quenzel. 15 Mar 64, 105p
Contract AF61 052 488

Unclassified report

Descriptors: (*Spectra (Infrared), Measurement), Infrared radiation, Solar radiation, Water vapor, Absorption, Atmosphere, Earth, Radiometers, Helicopters, West Germany.

A detailed theory and estimation of errors of an optical method to determine the total water vapor content of the atmosphere with an interference-filter actinograph is presented. A radiometer-instrumentation to determine the haze by infrared radiation measurements in the 2-3.5 micrometer-region from a helicopter is described.

AD-602 179 Div. 25, 9, 15
OTS Price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
VISCO-PLASTIC FLOW AT THE IMPACT OF A CYLINDER ON A PLATE.
by F. A. Bakhshiyan. Mar 64, 14p
TT 64 19346

Unclassified report

Trans. from Prikladnaya Matematika i Mekhanika (USSR) 1948, v. 12 no. 1, p. 47-52 .

Descriptors: (*Cylindrical bodies, Impact shock), (*Viscoelasticity, Mathematical analysis), (*Creep, Metal plates), Deformation, Shear stresses, Plasticity, Equations, Motion, Boundary value problems, Numerical analysis, Partial differential equations, Integration, Series, Bessel functions, Mechanics, USSR.

AD-602 184 Div. 25, 17
OTS Price $0.50

American Meteorological Society, Boston, Mass.
THEORETICAL BASIS OF THE EMPIRICAL COEFFICIENT IN GRUNEISEN'S FORMULA FOR CALCULATING THE CHARACTERISTIC TEMPERATURE.
by B. N. Oshcherin. Sep 63, 6p AmMetSoc T-R-411
Contract AF19 604 6113
TT 64 11826

Unclassified report

Teoreticheskoe Obosnovanie Empiricheskogo Koeffitsienta v Formule Gryunaisena dlya Rascheta Kharakteristicheskikh Temperatur, trans. of Poroshkovaya Metallurgiya (USSR) 1962 v. 2 no. 6, p. 12-13.

Descriptors: (*Equations of state, Theory), (*Metals, Temperature), Resistance (Electrical), Numerical analysis, Differential equations, Calculus of variations.

AD-602 186 Div. 25
OTS Price $1.25

Carlyle Barton Lab., Johns Hopkins Univ., Baltimore, Md.
MEASUREMENT OF RELAXATION-TIMES OF PARAMAGNETIC IONS IN CRYSTALS: RUBY.
Technical rept.,
by G. C. Brown, Jr. Jun 64, 42p AF111
Contract af33 657 11029, Proj. 4036, Task 403601

Unclassified report

Descriptors: (*Lasers, Ruby), (*Ruby, Fluorescence), (*Paramagnetic resonance, Relaxation time), Crystals, Aluminum compounds, Oxides, Impurities, Ions, Chromium, Excitation, Measurement, Atomic energy levels, Electron transitions, Light pulses, Measuring devices (Electrical and electronic), Circuits.

Experimental methods of measuring relaxation times (radiative and non-radiative) of the excited states of paramagnetic ions in crystals are described. In particular, various methods of excitation and detection of fluorescence radiation, when short lifetimes and/or weak fluorescence are involved, are discussed in some detail. Explicit solutions of the rate equations for a simple 3-level system are obtained in order to clarify the effects of the shape of the fluorescence excitation pulse on the fluorescence radiation which is observed. The fluorescence lifetimes of the R-lines of ruby have been measured at 77K and 297K over a wide range of Cr3+ concentrations (0.004% to 2.5%). On the assumption that the variation of R-line lifetime with temperature in standard ruby laser rods is the major factor which decreases the threshold efficiency for laser action with increasing temperature, these results would indicate the possibility of quasi-continuous laser action for a ruby rod with a Cr3+ concentration of the order of 0.002%. (Author)

An experimental program is in progress to measure various thermophysical properties of sodium, potassium, cesium, and their vapors. A complete reporting of the preliminary experimental results for potassium (saturation and superheat properties of the vapor, density and specific heat of the liquid) is presented together with a thermodynamic treatment of the data. Two equations of state are advanced, and additional saturation and superheat properties of the vapor are derived from these equations. Engineering properties (enthalpy, entropy, specific volume, and specific heat) and compositional information (weight fraction of dimer, weight fraction of trimer, and average molecular weight) are tabulated for some 800 selected vapor states in the temperature range from 1400 to 2525F and in the pressure range from 0.2 to 28 atm. (Author)

AD-602 247 Div. 25, 8
OTS Price $0.50

Rome Air Development Center, Griffiss AFB, N. Y.
ULTRASONIC CONVECTION COOLING,
by John E. McCormick and Thomas W. Walsh. May 64, 18p
Proj. 5519, Task 551904
RADC TDR64 179

Unclassified report

Descriptors: (*Coolants, Ultrasonic radiation), (*Ultrasonic radiation, Cooling), (*Electronic equipment), Electron tubes, Heat transfer, Vibration, Frequency.

The report discusses an investigation of ultrasonic cooling techniques. Natural and forced convective cooling parameters were measured, with and without the application of ultrasonic agitation. It was experimentally determined that application of the technique resulted in as much as a three-fold improvement in heat transfer. Comparisons of the effectiveness of the various modes of agitation were drawn. The heat transferred increases with increase in vibrational frequency. Conclusions concerning the potential worth of the technique, as applied to electronic equipment, are included in the report. One possible application is in the area of high power tubes, where a possible increase in lifetime, or increased power output, may be obtained. (Author)

AD-602 252 Div. 25
OTS Price $1.10

Kansas Univ., Lawrence.
STATUS REPORT. SPIN LATTICE RELAXATION, NUCLEAR ORIENTATION, AND MICROWAIVE RESONANCE AND RELAXATION!.
Rept. for 1 Mar-31 May 64,
by R. C. Sapp and J. W. Culvahouse. 3 Jun 64, 3p
Contract Nonr2775 00, Proj. NR018 202

Unclassified report

Descriptors: (*Nuclear spins, Relaxation time), (*Crystal lattices, Polarization), (*Microwave spectros spectroscopy, Resonance), Single crystals, Impurities, Neodynmium, Cobalt, Cerium, Iron, Superconductivity.

AD-602 275 Div. 25, 8
OTS Price $2.25

Inland Testing Labs., Dayton, Ohio.
QUARTZ CRYSTAL RELIABILITY STUDIES.
Rept. no. 4 (Final), 5 Apr 62-30 May 64.
by Carleton E. Jones. 30 May 64, 100p
Contract DA36 039sc89199

Unclassified report

Descriptors: (*Quartz, Failure (Mechanics)), (*Crystal oscillators, Reliability (Electronics), Crystals, Storage, Life expectancy, Frequency shift, Crystal holders, Tests, Aging (Materials), Resistance (Electrical), Shock (Mechanics), Vibration, Degradation.

Reliability study and development of reliability test methods and failure criteria for quartz crystals are reported. Includes complete data on 5000 hour operational test of 600 crystal units. (Author)

AD-602 281 Div. 25
OTS Price $3.00

High Velocity Lab., Univ. of Utah, Salt Lake City.
ENERGY PARTITIONING IN HIGH-VELOCITY-IMPACT CRATERING IN LEAD, PART I. INTERNAL ENERGY AND DEFORMATION IN ROD-TO-ROD IMPACT, PART II. RESPONSE OF A THERMOCOUPLE JUNCTION TO SHOCK WAVES IN COPPER, PART III.
Final rept.,
by Gerry H. Turner, E. Paul Palmer, David W. Pratt, and Harlan W. Christmas. May 64, 176p UU 10
Contract AF04 694 259

Unclassified report

Descriptors: (*Cratering, Energy), (*Impact shock, Energy), (*Shock waves, Cratering), Targets, Lead, Heating, Particles, Scattering, Recrystallization, Grain structures (Metallurgy), Deformation, Projectiles, Rods, Steel, Copper, Thermocouples.

Optical second-harmonic generation in semiconductors has been studied experimentally and theoretically to learn how energy-band structure and lattice symmetry influence the efficiency of harmonic conversion. Using a pulsed Nd3+: glass laser, harmonic generation was measured as a function of alloy composition in wurtzite ZnS-CdS and CdS-CdSe monocrystals to determine the effect of setting the energy gap at values either greater or less than the harmonic photon energy. In the CdS-CdSe series, the harmonic radiation was readily observable despite the strong absorption of harmonic light. The influence of lattice symmetry was studied by comparing harmonic generation in zinc-blende and wurtzite semiconductors having similar energy gaps, namely ZnSe, ZnTe, GaP, GaAs, CdS, CdSe, cubic ZnS, and hexagonal ZnS. It was found that the lattice structure had less effect upon the magnitude of these susceptibility-tensor components than the band structure. (Author)

AD-602 218 Div. 25, 10
OTS Price $2.00

Stanford Research Inst., Menlo, Park, Calif.
THE ROLE OF ALUMINUM AND ITS OXIDES AS SOURCES OR MODERATORS OF ELECTRONS IN SOLID PROPELLANT ROCKET EXHAUSTS.
Quarterly status rept. no. 7, 1 Jan-31 Mar 64,
by G. Neil Spokes. 31 Mar 64, 74p
Contract AF04 694 128, AF19 628 1651, SRI Proj. PAU4134
Unclassified report

This rept. includes: Comments on Gas-Solid Suspensions at High Temperatures, by E. M. Barston; and Ion Sampling From Chemical Plasmas, by G. N. Spokes and B. E. Evans.

Descriptors: (*Plasma physics, Exhaust gases), (*Thermionic emission, Plasma physics), Ions, Electrons, Density, Electric fields, Surfaces, Plasma sheath, Gas ionization, Nitrogen, Ionic current, Gas flow, Photoelectric effect, Aluminum compounds, Oxides, Particles, Flames, Mass spectrum, Solids, Colloids, High-temperature research.

Preliminary machine computations of electron distributions about a thermionically emitting particle are presented. Further work on ion sampling from chemical plasmas has shown that the process involves competition between hydrodynamic flow and the local electric fields at a sampling aperture. Further results are presented for flames and for nitrogen afterglows. (Author)

AD-602 219 Div. 25
OTS Price $1.10

Maryland Univ., College Park.
EXPERIMENTAL PROGRAM [AND] THEORETICAL PROGRAM.
Status rept. for 1 Mar-30 May 64,
by Hans R. Griem. 30 May 64, 8p
Contract Nonr595 10
Unclassified report

Descriptors: (*Atomic spectroscopy, Line spectrum), (*Plasma medium, Ultraviolet radiation), (*Shock waves, Magnetohydrodynamics), Plasma physics, Atomic orbitals, Photons, Detectors, Magnetic fields, Field theory.

Topics include: measurement of Stark broadening of lines from light elements; measurement of the UV radiation from shock-heated plasmas; and collisionless plasma shock wave experiment.

AD-602 234 Div. 25
OTS Price $1.10

Oregon State Univ., Corvallis.
Z CENTER ENERGY LEVELS.
Technical rept. no. 7,
by Wilbur V. Johnson and Allen B. Scott. 20 May 63, 8p
Contract Nonr1286 05, Proj. NR018 701
AD 600 617
Unclassified report

Rept. on a Magnetic Study of Color Centers in Alkali Halides.

Descriptors: (*Crystal lattice defects, Color centers), (*Color centers, Atomic energy levels), Alkali metal compounds, Halides, Sodium compounds, Potassium compounds, Chlorides, Impurities, Ions, Alkaline earth metals, Calcium, Strontium, Models (Simulations), Absorption spectrum, Wave functions.

Calculation was made of the electronic energy levels of the Z band model which assumes an unassociated alkaline earth cation with one trapped electron. The computations were carried out for Ca(2+) and Sr(2+), both in NaCl and KCl. The results predict an absorption well outside the visible range.

AD-602 236 Div. 25, 8
OTS Price $0.50

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
A PLANE WAVE EXPANSION THEOREM FOR CYLINDRICALLY RADIATED FIELDS.
Research rept.,
by S. N. Karp and N. R. Zitron. May 64, 20p
Contract AF19 628 3868, Proj. 5635, Task 563503
AFCRL 64 426
Unclassified report

Descriptors: (*Electromagnetic waves, Scattering), Electromagnetic fields, Cylindrical bodies, Integration, Series.

An asymptotic expansion for two-dimensional outwardly radiating fields is developed from an integral representation of these fields by means of a saddle point integration. The expansion is given in terms of inverse powers of the distance from a point in a fixed region A to a point in a circular neighborhood at a large distance from A. The coefficients are expressed in terms of plane waves and linear combinations of derivatives of plane waves with respect to angle of incidence. The theorem may be employed in scattering problems in reducing scattering of arbitary two-dimensional fields by arbitrary cylinders to scattering of plane waves by the arbitrary cylinders. (Author)

AD-602 243 Div. 25, 17
OTS Price $1.25

Naval Research Lab., Washington, D. C.
HIGH TEMPERATURE PROPERTIES OF SODIUM AND POTASSIUM.
Progress rept. no. 12, 1 Jul-30 Sep 63,
by C. T. Ewing, J. P. Stone, J. R. Spann, E. W. Steinkuller, and D. D. Williams. 9 Jun 64, 50p
Contract NASA C76320
NRL 6094
Unclassified report

Descriptors: (*Sodium, Thermodynamics), (*Potassium, Thermodynamics), (*Thermodynamics, Alkali metals), High-temperature research, Vapors, Vapor pressure, Volume, Temperature, Enthalpy, Entrophy, Equations of state, Molecular properties, Specific heat, Density, Experimental data, Liquid metals, Tables.

Descriptors: (*Personnel management, Military personnel), (*Military personnel, Management control systems), Operations research, Management planning, Inventory, Wages, Simulation, Computers, Data processing systems, Recruiting, Weapon systems, Military training, Decision making.

MOON (Meeting Our Operational Needs) is a product of operations research conducted for the Personnel Systems Research Branch, Personnel Research Division, by the American Institute for Research. It is a management tool, designed to aid decision-making in the area of personnel plans and policies, by providing projections of the enlisted personnel inventory under specified conditions. This handbook has been prepared to introduce MOON to its prospective users in the Bureau of Naval Personnel--to describe the types of management problems to which it applies, the kinds of standard reports which can be furnished, and the method for making projection requests. (Author)

AD-601 957 Div. 26, 8, 25
OTS Price $4.00

Texas Instruments, Inc., Dallas.
QUALITY CONTROL MANUAL INSPECTION PROCEDURES FOR GERMANIUM PNP EPITAXIAL DEVICE TYPE 2N964.
Item 2
15 Aug 63, rev., 275p MPQRA-100A
Contract DA36 039SC86730

Unclassified report

Descriptors: (*Semiconductor devices, Quality control), (*Germanium, Quality control), (*Quality control, Instruction manuals), Test methods, Test equipment, Packaging, Semiconductor devices, Epitaxial growth, Reliability (Electronics), Standards, Specifications.

AD-601 958 Div. 26, 8, 25
OTS Price $4.00

Texas Instruments, Inc., Dallas.
QUALITY CONTROL MANUAL INSPECTION PROCEDURES FOR SILICON NPN PLANAR EPITAXIAL DEVICE TYPE 2N744.
Item 3
15 Aug 63, rev., 279p MPQRA 101A
Contract DA36 039SC86730

Unclassified report

Descriptors: (*Semiconductor devices, Quality control), (*Silicon, Quality control), (*Quality control, Instruction manuals), Test methods, Test equipment, Packaging, Semiconductors, Epitaxial growth, Reliability (Electronics), Standards, Specifications.

AD-602 051 Div. 26, 17
OTS Price $6.60

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
TENSILE STRENGTHS OF STEEL CONNECTIONS HAVING TRANSVERSE AND LONGITUDINAL FILLET WELDS.
Final rept. for 1 Jul 61-30 Jun 62,
by Olin S. Lord and F. W. Schutz, Jr. 22 Jan 63, 61p
Contract NBy37614, Proj. A566

Unclassified report

Descriptors: (*Steel, Welds), (*Welds, Steel), Welding rods, Metal plates, Tensile properties, Test methods, Tests, Failure (Mechanics), Experimental data.

The test data from a series of tests on steel connections having transverse and longitudinal fillet welds is reported in this paper. Testing techniques, procedures and test data are all that will be included in this report. (Author)

AD-602 054 Div. 26, 8
OTS Price $2.75

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
ELECTRON BEAM TECHNIQUES FOR FABRICATION AND ASSEMBLY OF PARTS FOR ELECTRON TUBES.
Final rept., Phase 1, 1 Jul 63-29 Feb 64
by J. F. Dudenhoefer. 29 Feb 64, 143p EBR136
Contract DA36 039AMC03625E

Unclassified report

Descriptors: (*Machining, Electron beams), (*Welding, Electron beams), (*Electron beams, Manufacturing methods), Electron tubes, Electron tube parts, Joints, Configuration, Tests, Mechanical properties, Impact shock, Visual inspection, Vibration, Photographs, Experimental data.

The objective of this Production Engineering Measure is to evaluate the feasibility of production electron beam welding and machining of typical electron tube materials. The fundamentals of the electron beam process, including its advantages over more conventional techniques, are briefly discussed. Materials procured for evaluation are listed. The configurations welded and evaluated are tabulated along with the evaluation procedures and results. A discussion of test results is presented.

AD-602 277 Div. 26, 14, 30
OTS Price $2.25

Douglas Aircraft Co., Inc., Santa Monica, Calif.
ULTRASONIC TECHNIQUES AND STANDARDS FOR TESTING FILAMENT-WOUND STRUCTURES.
Rept. for 1 May 63-27 Mar 64,
by C. J. Adams, N.H. Radtke, and J. D. Klein. may 64, 100p
Contract AF33 657 10995, Proj. 7381, Task 738102
ML TDR64 117

Unclassified report

Descriptors: (*Filament wound construction, Nondestructive testing), (*Ultrasonic radiation, Test methods), Standards, Glass textiles, Composite materials, Structural parts, Reinforcing materials, Echo ranging, Pressure vessels, Tests.

Optimum techniques and standards were developed for ultrasonic testing of filament-wound reinforced resin-glass structures. Filament-wound reference test blocks, 0.1 in. to 2.0 in. thick (in 1/4 in. increments), were fabricated. Blocks were prepared of optimum quality and with simulated defects. One set of optimum blocks was adhesively bonded to rubber liners that were 0.080 in. to 3.0 in. thick. Ultrasonic tests were performed to measure acoustic properties and to establish optimum test conditions to detect such defects as delaminations, unbond, porosity, and resin content. Ultrasonic tests were performed by immersed through-transmission methods and by both immersed and contact pulse-echo methods. It was found that the optimum method of defect detection was through-transmission testing with facsimile recording. A combination of through-transmission methods and pulse-echo methods was used in evaluating defects detected by through-transmission testing. Pressure vessels obtained from several manufacturers of filament-wound structures were ultrasonically tested by techniques and standards developed in this program. Discontinuities in these chambers were reliably detected. (Author)

26. PRODUCTION AND MANAGEMENT

AD-601 722 Div. 26, 17
OTS Price $6.60

Western Gear Corp., Lynwood, Calif.
HIGH ENERGY RATE FORGING OF COMMERCIALLY PURE TUNGSTEN AND TZM MOLYBDENUM ALLOY.
Final technical progress rept., Phase 3, Oct 62-May 63
Apr 64, 64p WGC 6404 224
Contract AF33 600 42523, Proj. 7 866
AMC TR7 866 6

Unclassified report

Descriptors: (*Forging, Heat-resistant metals and alloys), (*Tungsten, Forging), (*Molybdenum alloys, Forging), Powder alloys, Castings, Rocket motor nozzles, Nozzle inserts, Titanium alloys, Zirconium alloys, Microstructure, Dies, Metallography, Failure (Mechanics), Grain structure (Metallurgy), Tensile properties, Shear stresses, Compressive properties.

A manufacturing methods study was conducted to determine the possibility of forging unwrought tungsten and molybdenum alloy by the high energy rate forging (HERF) method. Successful HERF of unwrought refractory materials was found to be highly dependent upon the forging configuration and die design. Good forgings are possible when working stresses in the forged parts are compressive in nature. Tensile and shear stresses during forging generally result in fracturing of the billet if the refractory metals have received little or no plastic working prior to forging. Data for forging conditions and results of metallurgical examinations are presented. (Author)

AD-601 760 Div. 26
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio
APPROXIMATE ESTIMATION OF THE FORMING ENERGY OF THIN-WALLED COMPONENTS,
by M. A. Anuchin and L. P. Orlenko. 12 May 64, 16p
FTD TT64 249; TT 64 11799

Unclassified report

Unedited rough draft trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1962, no. 12, p. 158-167.

Descriptors: (*Material forming, Numerical analysis), (*Explosive forming, Material forming), (*Hydroforming (Mechanical), Material forming), USSR, Energy, Stresses, Mechanical properties, Deformation, Energy management, Production, Steel, Stainless steel.

This article contains an approximate method for calculating the explosive forming energy of thin-walled, axisymmetric components. The calculations made by the proposed method were verified experimentally on a special apparatus for hydraulic stamping. The forming energy for a component is the sum of the energies, including deformation energy from tension-compression stress, bending energy, and friction. The bending energy for thin-walled components is small, so that it is possible to omit it from the total sum. It is difficult to estimate friction by theoretical means, because of the difficulty of determining the magnitudes of the compressive stress and the pressure on the stretched edge of the mold. In ordinary stamping on presses these energies are about 20% of the total energy. Experimental results show that the bending and friction energies which were disregarded in hydraulic forming also are about 20% of the total deformation energy, i.e., in slow speed stamping, the bending and friction loads may be taken into account.

AD-601 765 Div. 26
OTS Price $1.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
AN OUTLINE OF A METHOD FOR THE INVESTIGATION OF THE STABILITY OF GAS-LUBRICATED TILTING-PAD JOURNAL BEARINGS.
Interim rept.
by E. J. Gunter, Jr. and V. Castelli. Apr 64, 53p
I-A2049 21
Contract Nonr2342 00, Task NR062 316

Unclassified report

Descriptors: (*Journal bearing, Stability), Lubrication, Gas bearings, Films, Thickness, Mechanics, Perturbation theory. Geometry, Partial differential equations.

Tilting-pad journal bearings are extremely stable under ordinary conditions, but under certain extreme conditions they may develop some form of self-induced instability. This report outlines a method for the analysis of the stability of this type of bearing based on the small perturbation technique. Discussed in detail are the choice of coordinates, the geometry of the bearing, and the kinematics of the bearing. (Author)

AD-601 784 Div. 26, 7, 14; 17
OTS Price $4.00

American Power Jet Co., Ridgefield, N. J.
RELIABILITY PREDICTION FOR MECHANICAL AND ELECTROMECHANICAL PARTS.
Final rept.,
by George Chernowitz, Samuel J. Bailey, Angelo W. Castellon, and Gerald L. Geltman. May 64, 297p
APJ 360 1
Contract AF30 602 2991, Proj. 5519, Task 551902
RADC TDR64 50

Unclassified report

Descriptors: (*Bearings, Failure (Mechanics)), (*Gears, Failure (Mechanics)), (*Electrical equipment, Failure (Mechanics)), (*Air Force equipment, Reliability), Brushes, Materials, Fracture (Mechanics), Alloys, Production, Mathematical prediction, Stresses, Creep, Rupture, Wear resistance, Toughness, Fatigue (Mechanics), Thermal stresses, Surface properties, Corrosion.

The reliability of selected parts is investigated from the viewpoint of materials behavior throughout parts-materials history, including process, fabrication, test, handling, and early operation. The parts studied are: Mechanical (bearings and gears), Electromechanical (brushes and contacts). Failure mechanisms were examined on the basis of a SCWIFT taxonomy: S - Stress-Creep Rupture; C - Corrosion; W - Wear; I - Impact; F - Fatigue; T - Thermal. Dominant among the mechanisms of failure were wear and fatigue phenomena. A multistage process was developed for organizing analytical and empirical investigation of part failure causes in a broader sense, based on materials influences which may be statistically related to part survival. The definition of a retrospective part survival function was proposed. Data and relationships covering flaw propagation, fracture, corrosion, surface fatigue, and the influence of materials and manufacture was given for the parts studied. (Author)

AD-601 913 Div. 26, 18, 30
OTS Price $0.75

American Inst. for Research, Washington, D. C.
THE MOON PROJECTION HANDBOOK.
Jun 64, 22p AIR C3 6 64RP
Contract Nonr2872 00

Unclassified report

27. PROPULSION SYSTEMS

AD-601 715 Div. 27, 1
OTS Price $3.50

Hiller Aircraft Corp., Palo Alto, Calif.
PULSE REACTOR LIFT-PROPULSION SYSTEM DEVELOPMENT PROGRAM.
Final rept.
by R. M. Lockwood. Mar 63, 230p ARD-308
Contract NOw61 0226c

Unclassified report

Descriptors: (*Propulsion, Vertical take-off planes), (*Pulsejet engines, Vertical take-off planes), Aircraft, Lift, Combustion chambers, Thrust augmentor nozzles, Fuel injectors, Control systems, Ground effect, Materials, Toughness, Design, Performance (Engineering), Captive tests, Graphics, Mechanical drawings, Photographs.

The Pulse Reactor Engine Program is aimed at developing efficient, high performance lift-propulsion systems that have no moving parts. The Pulse Reactor engine is unique in that it rejects foreign particles that are denser than air; therefore, it can operate in the interface between ground and air that is denied to other aircraft lift-propulsion systems. In particular, development has been concerned with the performance effects of (1) engine size, (2) new shapes, (3) forward flight and vertical flight performance, (4) engine controls and accessories, (5) pulse reactor materials, construction techniques and engine durability.

AD-601 837 Div. 27
OTS Price $0.75

Air Force Aero Propulsion Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
ARC-OVER AND RAPID PUMPDOWN TESTS ON THE CESIUM CONTACT IONIZATION ENGINE FLIGHT TEST PAYLOAD.
Rept. for 4-15 May 63,
by Edward T. Mahefkey and Robert H. Johnson. May 64, 30p
ASD TDR63 867

Unclassified report

Descriptors: (*Space propulsion, Reliability), (*Ion engines, Tests), Plasma jets, Cesium, Electric arcs, Failure (Mechanics), Flight tests, Simulation, Checkout procedures, Test equipment, Calibration, Magnetic fields, Vacuum systems, Payload.

Flight profile simulation tests of a cesium ion engine flight test payload were conducted to investigate possible causes of the failure incurred in the first in-space flight test of the cesium ion engine. The engine package, composed of the engine and power conditioning equipment, was subjected to a series of flight pressure profile tests to determine the behavior of the package during launch. Steady state arc-over pressure tests were also made to ascertain the pressure at which high voltage gaseous breakdown would occur. The results of these tests proved that the engine package is a negligible outgassing source. The pressure at which steady state arc-over was experienced was shown to be relatively high, proving that any arc-over experienced in the flight test was not initiated by outgassing in the engine package. (Author)

AD-601 966 Div. 27, 17
OTS Price $1.60

TRW Electromechanical Div., Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
TUNGSTEN INSERT FIRING EVALUATION.
Interim engineering progress rept. no. 1, 1 Feb-31 May 64,
by L. J. Stefan. 31 May 64, 15p TRW ER5996
Contract AF33 615 1025
RTD TR7 797A I

Unclassified report

Descriptors: (*Rocket motor nozzles, Nozzle inserts), (*Nozzle inserts, Tungsten), (*Tungsten, Nozzle inserts), Rocket motors(Solid propellant), Captive tests, Tungsten alloys, Molybdenum alloys, Material forming, Design.

The design and assembly of nozzles to be utilized in testing the first two W-2%Mo solid rocket nozzle inserts was completed. The nozzles will be fired on the Rocket Propulsion Laboratory solid rocket motor simulator. The inserts were closed die forged from stock that was vacuum centrifugal cast and extruded. (Author)

AD-602 048 Div. 27
OTS Price $2.25

Marquardt Corp., Van Nuys, Calif.
RAMJET TECHNOLOGY PROGRAM, 1963. SECTION XIV. AEROTHERMAL CAPABILITY OF PLASMA HEATERS. SECTION XV. HIGH PRESSURE AIR GENERATION.
Final summary rept., Vol. 11, 25 Jan 63-28 Feb 64,
by J. K. Totten. Jun 64, 85p Marq 25 116
Contract AF33 657 12146

Unclassified report

Descriptors: (*Ramjet engines, Engine air systems components), (*Plasma jets, High-pressure research), (*Pressure vessels, Engine air systems components), Jet engines, Heaters, Plasma physics, Electric arcs, Supersonic flow, Thermal radiation, Enthalpy, Electrodes, Magnetic fields, Cryogenics, Gas generating systems, Feasibility studies.

The objective of the plasma arc heater program was basically to design, fabricate, and test plasma heaters capable of operating at pressure levels beyond the current state-of-the-art. One particularly outstanding test run with air at 2800 psia produced a gas enthalpy level of 3150 Btu/lb at a 0.135 lb/sec flow rate with an arc power of 1.12 Mw. Another experimental arc heater was successfully operated at 7600 psia or approximately 200 atmospheres. This plasma heater demonstrated the feasibility of arc heaters at extremely high pressures. The purpose of the high pressure air generation program was to demonstrate the practicability of creating extremely high pressures utilizing the principle of heating a cryogenic fluid in a constant volume vessel. The numerical goal of pressure levels in excess of 50,000 psia was successfully met when one test run attained a pressure level of 62,800 psia, at a fluid temperature of 790R. In addition, a method for obtaining and documenting pressure, volume, and temperature data at pressures in excess of currently available information was successfully demonstrated. (Author)

AD-602 049 Div. 27
OTS Price $1.00

Marquardt Corp., Van Nuys, Calif.
RAMJET TECHNOLOGY PROGRAM, 1963. SECTION XVIII: HIGH TEMPERATURE COATED TUNGSTEN STRUCTURES.
Final summary rept., Vol. 10, 25 Jan 63-31 Jan 64,
by J. K. Totten. Jun 64, 32p, Marq 25 116
Contract AF33 657 12146

Unclassified report

Descriptors: (*Ramjet engines, Engine structures), (*Tungsten, Corrosion inhibition), (*Refractory coatings, Corrosion inhibition), Refractory metals, Refractory metal alloys, Oxidation, Tungsten alloys, Tantalum alloys, Hafnium alloys, Coatings, Vapor plating, Flame spraying, Combustion chambers.

Division 26 - PRODUCTION AND MANAGEMENT

AD-602 279 Div. 26, 14, 31
OTS Price $1.50

Aerojet-General Corp., Azusa, Calif.
DETERMINATION OF EFFECTS OF MATERIALS AND PROCESS VARIABLES ON FILAMENT-WOUND STRUCTURES.
Quarterly progress rept. for 15 Feb-15 May 64,
by B. E. Chester. Jul 64, 52p AGC 0827 02 2
Contract N140 131 75687B X, Projs. 6438, SF 012 01 03,
Task 217

Unclassified report

Descriptors: (*Filament wound construction, Composite materials), (*Composite materials, Filament wound construction), Glass textiles, Reinforcing materials, Nondestructive testing, Loading (Mechanics), Ultrasonic radiation, Hydrostatics, Test methods, Submarine hulls, Materials, Production.

Progress of program during the quarter, with emphasis on test specimen refinement, is described. Test results and fabrication procedures are discussed and supported with illustrations. Fabrication and test methods are appended to the report. Projected work and program schedule are included. (Author)

AD-602 301 Div. 26, 18, 30
OTS Price $14.50

Air Force Systems Command, Washington, D. C.
USAF PERT. VOLUME V. PERT IMPLEMENTATION MANUAL.
Final rept.
Apr 64, 215p

Unclassified report

Descriptors: (*Management engineering, Handbooks), (*Air force operations, Operations research), Scheduling, Management planning, Management control systems, Costs, Systems engineering, Logistics.

Chapter headings are: (1) Implementation plan, (2) Work breakdown structure, (3) Network development, (4) Scheduling, (5) Data flow, (6) Reports and analysis, (7) Evaluation of contractor's PERT implementation.

AD-602 151 Div. 27, 10
OTS Price $3.50

Princeton Univ., N. J.
NONLINEAR ASPECTS OF COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKET MOTORS.
Yearly progress rept. no. 4, 1 Jun 63-31 May 64,
by David T. Harrje and William A. Sirignano. 1 Jun 64, 205p
AER553d
Contract NASr217, Grant NsG99 60

Unclassified report

Descriptors: (*Rocket motors (Liquid propellant), Combustion), (*Liquid rocket propellants, Combustion), Stability, Mathematical models, Oscillation, Resonance, Nonlinear systems, Rocket motor nozzles, Fuel injectors, Subsonic flow, Vapors, Drops, Wake.

Topics include: Nonlinear theoretical approaches - longitudinal and transverse modes (calculations based on the nonlinear longitudinal mode with time-lag effects, a shock wave model of unstable rocket combustors with small time-lag effects, transverse nozzle admittance relation for finite-amplitude waves); Nonlinear combustion instability mechanisms (transverse mode nonlinear rocket motor studies, longitudinal nonlinear rocket studies using the square-motor, vapor displacement mechanism - basic experiment in the pseudo rocket, basic experiments in droplet resonant phenomena); Droplet and wake burning - mechanism for combustion instability; High subsonic mach number extensions to the linearized theory; Expressions for transverse waves; Concept in rocket baffle design.

AD-602 199 Div. 27, 14
OTS Price $0.75

Atlantic Research Corp., Alexandria, Va.
CASTABLE CARBON FOR NOZZLE APPLICATIONS.
Quarterly progress rept. no. 1, 2 Mar-1 Jun 64,
by James D. Batchelor. 18 Jun 64, 26p
Contract AF04 611 9718, Proj. 3059
RPL TDR64 76

Unclassified report

Descriptors: (*Rocket motor nozzles, Carbon), (*Carbon, Rocket motor nozzles), Nozzle inserts, Casting, Additives, Binders, Furfuryl alcohols, Mechanical properties, Rupture, Compressive properties, Thermal properties, Erosion, Thermal insulation.

The effects of changes in castable carbon binder content, filler solids composition, and fabrication techniques were investigated. Visual examination, mechanical testing, and thermal testing were used to judge the quality of test pieces. The first sub-scale nozzle was designed and partially fabricated. Castable carbon material will be used in the entrance section, as the insert back-up insulation, and in the exit cone region. (Author)

AD-602 254 Div. 27, 9
OTS Price $2.50

Philco Research Lab., Newport Beach, Calif.
JET INTERACTION TEST PROGRAM (CCN NO. 39).
Engineering Analysis technical note no. 30,
by A. I. Karydas and H. T. Kato. 22 Jun 64, 114p U-2634
Contract AF04 694 23

Unclassified report

Descriptors: (*Rocket motor nozzles, Exhaust gases), Vacuum systems, Simulation, Altitude chambers, Jets, Nitrogen, Cylindrical bodies, Loading (Mechanics).

An experimental and theoretical investigation was conducted to study the jet impingement forces on a right circular cylinder in the flow field of a rocket nozzle exhausting into a vacuum or near-vacuum environment. In the theoretical investigation, an approximate method based on radial flow of the exhaust jet and a Newtonian approximation was developed to predict the jet impingement forces on a cylinder in a vacuum. The experimental investigation was performed in the Aeronutronic high-altitude chamber to determine the jet impingement forces and pressures on two instrumented cylinder models. Unheated nitrogen gas was exhausted from a conical nozzle into the test chamber at a nominal starting altitude of 250,000 feet. Six positions of the cylindrical models relative to the nozzle exit were investigated. In general, results of the experimental investigation indicate that the forces measured under essentially vacuum conditions are applicable to the case of a pure vacuum environment. Good agreement was obtained between the experimental force results and the theoretical results. The experiments also indicate that the decrease in altitude during testing because of the addition of mass from the nozzle can have a significant effect on the jet impingement force. (Author)

Division 27 - PROPULSION SYSTEMS

The goal of the high temperature coated tungsten structures program was to develop methods of protecting tungsten substrates, in oxidizing environments, to temperatures in excess of 3460R. Material systems of binary, ternary, and quaternary alloys were synthesized in an arc-melting furnace and then screened for oxidation resistance using an oxy-acetylene torch. This resulted in the development of a binary hafnium-tantalum alloy that withstood temperatures well above 3460R, under oxidizing conditions. The oxide grown from the base alloy was well-bonded, thermal shock resistant, and dense. A feasibility study on the coating of the test specimens was accomplished by plasma-arc spraying and slurry coating the alloy powders onto tungsten and 90 percent tantalum-10 percent tungsten substrates of various configuration. This work demonstrated the feasibility of utilizing this very promising material system as a coating for oxidation protective refractory metals. (Author)

AD-602 084 Div. 27, 4,9
OTS Price $1.00

Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
TASK R.
Quarterly progress rept. no. 21, 1 Apr-30 Jun 64
by A. A. [illegible] 30 Jun 64, 31p APL/JHU SR4 5
Contract NOw62 0604c, ARPA Order22 63

Unclassified report

Descriptors: (*Gas flow, Dissociation), (*Molecular beams, Reaction kinetics), (*Nozzle gas flow, Gas analysis), Atoms, Oxygen, Dioxides, Nitrogen compounds, Electrons, Spin, Molecular properties, Helium, Argon, Rocket motor nozzles, Fluid mechanics, Infrared spectroscopy, High-temperature research, Propulsion.

Physico-chemical and fluid dynamic behavior of high temperature, high speed gas flows that occur in most advanced propulsion systems are investigated. Particular attention is given to studies of dissociated gas flow, molecular beam chemical kinetics, and rocket nozzle fluid dynamics.

AD-602 102 Div. 27, 10, 30
OTS Price $1.25

Marine Engineering Lab., Annapolis, Md.
A METHOD FOR SYNTHESIS AND SELECTION OF PROPULSION PLANTS FOR SUBMARINES.
Research and development rept.
by James F. Blose and Joseph F. McCartney. 19 Jun 64, 41p
Contracts N600 61533 61294 and N600 61533 61394,
Proj. SF013 01 03, Task 0218
Mel-A 67 64

Unclassified report

Prepared in cooperation with Westinghouse Electric Co.

Descriptors: (*Submarine engines, Systems engineering), (*Underwater propulsion, Submarine engines), (*Systems engineering, Submarine engines), Mathematical models, Performance (engineering), Fuel systems, Oxidizers, Energy conversion, Range (distance), Slurry fuels, Design, Digital computers, Weight, Velocity, Submarine hulls, Internal combustion engines, Diesel engines, Liquefied gases, Oxygen.

New concepts for submarine propulsion plants are continuously being presented to the Navy for review and possible application. An analytical method is now being used to determine the effect of power plant weight and thermal efficiency on the cruising radius, speed, and vessel displacement. A mathematical model representing the propulsion plant and vessel hull was prepared and, by means of a digital computer, the effects of varying several design parameters were studied. By comparing the predicted performance of several types of power plants with the results of the computer study it is possible to select those which justify further development for Navy use. (Author)

AD-602 113 Div. 27, 31
OTS Price $1.50

Naval Boiler and Turbine Lab., Philadelphia, Pa.
ANALYSIS AND AUTOMATIC CONTROL SYSTEM DESIGNS FOR MAIN PROPULSION MACHINERY.
by J. W. Banham, Jr. 24 Jun 64, 58p
Task 4200
NBTL B452I

Unclassified report

Descriptors: (*Steam power plants, Control systems), (*Marine surface propulsion, Steam power plants), Marine propulsion, Boilers, Design, Automatic, Gas flow, Pressure, Steam, Ship auxiliary equipment.

The report presents a summary of the background and experience of the Naval Boiler and Turbine Laboratory in the field of automatic control of marine steam power plants. It is intended to provide information to specification writers, ship designers, machinery suppliers, and control system contractors that will be of value to them in their task of establishing the detail requirements for automation system design in accordance with the best state-of-the-art design practices. Discussion of recommended practices, with examples of current problems, is presented for control systems for boiler water level, steam pressure, air flow, fuel flow, and auxiliary machinery and systems. General application of system design philosophies are discussed.

AD-602 115 Div. 27, 25
OTS Price $3.00

Ion Physics Corp., Burlington, Mass.
CONDENSATION COLLOIDAL ION SOURCE.
Summary technical rept. for 1 Jun 62-1 Jun 63.
by A. Lucille Cox, S. Harrison and S. Graybill. 12 Jun 64,

12187p
Contract AF33 657 8743, Proj. 3141, Task 314104
ASD TDR63 825

Unclassified report

Descriptors: (*Ion engines, Particle beams), (*Colloids, Particle beams), Electric propulsion, Ion sources, Cooling, Electrons, Space charges, Nozzles, Performance (Engineering), Lithium, Sodium, Nucleation, Ion beams, Electric arcs, Thrust, Condensation.

The report describes the experimental and analytical efforts on the evaluation of the controlled-growth, condensation colloidal ion source concept as a means of producing propellant particles for use in an electrostatic ion engine. An improved concept is presented which depends on convection rather than radiation for cooling the particles and assumes the presence of electrons in the nozzle. These factors relieve space charge restrictions but necessitate removal of electrons downstream from the throat and increase the requirements for collisions. Design considerations to provide the necessary conditions are discussed and were incorporated in the construction of a controlled-growth colloidal ion engine which performed well in thrust tests. Theoretical analyses show that sodium or lithium could give the performance required of a colloidal ion engine if neutral nucleation is insignificant. Detailed experimental studies of nozzles and ionizers are described which indicate that the skimmer nozzle and a free arc ionizer can best fulfill the requirements of the colloidal ion source. (Author)

AD-601 834 Div. 28, 1, 30
OTS Price $2.25

Bell Helicopter Co., Fort Worth, Tex.
ALTIMETER DISPLAY STUDY. PART I. SUMMARY AND REVIEW OF DATA REQUIREMENTS.
Final rept., pt. 1, May 60-Jan 63,
by W. G. Matheny. May 64, 86p
Contract AF33 616 8236, Proj. 6190, Task 619008
ASD TDR63 621 P

Unclassified report

Descriptors: (*Altimeters, Display systems), (*Flight control systems, Specifications), (*Human engineering, Display systems), (*Data processing systems, Control systems), Control panels, Design, Operations research, Optimization, Aviation personnel, Operators (Personnel), Training, Reviews.

The report presents a brief overview of a number of reports dealing with the subject of flight control information requirements. The distinction is made between system data requirements (as the totality of data to be processed by the system) and information requirements (as the totality of data to be processed by the human operator).

AD-601 868 Div. 28
OTS Price $0.75

Institute for Social Research, Univ. of Michigan, Ann Arbor.
INDIVIDUAL TASK PERFORMANCE IN A CHANGING SOCIAL STRUCTURE.
Technical rept. no. 28,
by Eugene Burnstein and Robert B. Zajonc. 15 Jun 64, 23p
Contract Nonr1224 34, Proj. NR170 309

Unclassified report

Descriptors: (*Group dynamics), (*Performance Tests), (*Motivation), Reaction (Psychology), Effectiveness, Reflexes, Stimulation, Behavior, Performance (Human), Stress (Psychology), Control, Sociometrics, Social communication, Statistical analysis, Social psychology, Analysis of variance.

The relationship between changes in status and task performance involving simple reaction time responses is studied. Status is manipulated by assigning to group members different degrees of control over the group product and by subsequently creating conditions which require that control be reallocated. The degree of control members have over the group product defines their status rank in the group. Two experiments are presented in which performance effects deriving from status changes are examined. In the first, the highest ranked member is demoted and the lowest ranked member, promoted. In the second experiment members of intermediate ranks are shifted both up and down. Both experiments demonstrate that a member's performance improves when his status is increased and his performance suffers when his status is decreased. (Author)

AD-601 882 Div. 28
OTS Price $0.50

Washington Univ., St. Louis, Mo.
MEASUREMENT OF INDEPENDENCE AND NET CONFORMITY BY REPEATED RANKINGS.
Technical rept.
by Richard H. Willis. Jun 64, 19p
Contract Nonr816 12, Proj. NR171 488

Unclassified report

Descriptors: (*Group dynamics, Statistical analysis), (*Personality), (*Behavior), Adjustment (Psychology), Psychometrics, Social psychology, Reaction (Psychology), Measurement, Stimulation, Sociometrics, Leadership, Attitudes.

A method is developed for the simultaneous measurement of two dimensions of social response (independence and net conformity) from data obtained from ranking tasks, and for relating the results to the diamond model of social response. The new method supplements another devised earlier for the measurement of independence and net conformity from binary response data. The problem of sideways movement, encountered in the customary ranking procedures of measuring social influence, is discussed. The method developed here provides a solution to this problem in those cases in which the design of the experiment allows a simulated interaction situation, as contrasted with an actual interaction situation. Two pilot experiments are reported which demonstrate the feasibility of the new method, and which provide some notion of certain of its characteristics. (Author)

AD-601 971 Div. 28, 23
OTS Price $1.00

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
CERTITUDE JUDGMENTS AND ACCURACY OF INFORMATION ASSIMILATION FROM VISUAL DISPLAYS,
by Robert S. Andrews, Jr. and Seymour Ringel. May 64, 31p
Proj. 2J024701A723
APRO TRN145

Unclassified report

Descriptors: (*Decision making, Psychometrics), (*Display systems, Visual perception), Reaction (Psychology), Military tactics, Data processing systems, Armed forces operations, Photographs.

The study was conducted to determine the extent to which certitude coincides with the accuracy of information assimilation. Divergence would indicate the importance of separate consideration of certitude in relation to information presentation variables. The study was also designed to reveal something of the nature of the certitude-accuracy relationship, and to provide insight into the possible implications of certitude for command decision making. More specifically, the study was concerned with the degree to which accuracy of information assimilation from displays and self-judgments of certitude of the accuracy of the assimilation were similarly affected by variations in (1) the amount of information presented in a slide, (2) the number of symbols removed from a slide, and (3) varying combinations of amount and symbols removed. A prelude to the analysis was the evaluation of an eight-point interval scale as a vehicle for obtaining certitude judgments. (Author)

AD-601 973 Div. 28, 23
OTS Price $0.75

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
INFORMATION ASSIMILATION FROM ALPHA-NUMERIC DISPLAYS; AMOUNT AND DENSITY OF INFORMATION PRESENTED,
by Seymour Ringel and Charles Hammer. Apr 64, 26p
Proj. 2JO24701A723
APRO TRN141

Unclassified report

Descriptors: (*Display systems, Learning), (*Learning, Visual perception), (*Data processing systems, Simulation), Reaction (Psychology), Psychometrics, Density, Photographs.

In a laboratory study of information assimilation under simulated command information processing system procedures, 30 subjects were required to extract specific items of information from a series of slide projected displays. Speed (search time) and accuracy of information assimilation were analyzed to determine whether they were affected by amount of information (number of lines in a slide), density (ratio of letter height to space between lines), position of pertinent information on the slide, and complexity (number of

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-601 716 Div. 28, 22
OTS Price $3.50

Human Engineering Labs., Aberdeen Proving Ground, Md.
HUMAN FACTORS ENGINEERING DESIGN STANDARD FOR VEHICLE FIGHTING COMPARTMENTS,
by Robert E. Hedgcock and Robert F. Chaillet. May 64, 240p
HEL S2 64

Unclassified report

Descriptors: (*Human engineering, Armored vehicles), (*Armored vehicles, Human engineering), Army personnel, Armament, Anthropometry, Standards, Design, Vehicle instruments, Display systems, Control systems, Storage, Optical instruments, Ammunition, Environment, Safety, Maintenance, Communication equipment.

The design of military fighting equipment to provide maxium performance as well as safety and comfort is discussed in terms of the human anatomical and physiological potential.

AD-601 751 Div. 28
OTS Price $5.60

Institute of Behavioral Research, Texas Christian Univ., Fort Worth.
THE DIMENSIONAL STRUCTURE OF CAMPUS STUDENT ORGANIZATIONS.
Technical rept. no. 5
by Nurhan Findikyan and S. B. Sells. Jun 64, 56p
Contract Nonr3436 00

Unclassified report

Rept. on Dimensions of Stimulus Situation Which Account for Behavior Variance.

Descriptors: (*Group dynamics, Sociometrics), (*Behavior), (*Psychometrics), Personality, Performance (Human), Environment, Social communication, Adjustment (Psychology), Students, Universities, Attitudes, Reaction (Psychology), Factor analysis.

Physical and social environmental stimuli which may account for variances in behavior were investigated in oder to arrive at a taxonomy of situational variables which will enhance the control and prediction of individual behavior. Questionnaires were administered to 967 university students belonging to 54 different campus organizations and a principal components factor analysis was applied. Results were intercorrelated and analyzed, and it was determined that although the 54 groups were categorized into 6 major divisions without sacrificing homogeneity, a hierarchial profile analysis is needed to corroborate the decision.

AD-601 816 Div. 28
OTS Price $0.50

Harpur Coll., Endicott, N. Y.
TEAMWORK UNDER TURNOVER AND SUCCESSION.
Technical rept. no. 2
by Donald B. Trow. Jun 64, 20p
Contract Nonr3679 00, Proj. NR170 331

Unclassified report

Descriptors: (*Group dynamics, Performance (Human)), (*Job analysis, Group dynamics), Adjustment (Psychology), Leadership, Sociometrics, Social psychology, Intelligence tests, Intercommunication systems, Typewriters.

Twenty-eight groups were observed performing a task that requires teamwork but allows flexibility of organization. The teams were made to experience varied amounts of membership replacement. Team performance was found to suffer significantly: (a) if the number of members replaced was large relative to the past history of the team; (b) if succession in the control position was involved; and (c) if the successor's intelligence was lower than his predecessor's. Performance did not suffer if (a) the number of members replaced was large absolutely but not relatively or (b) replacement occurred as turnover in subordinate positions; further, (c) performance was unrelated to intelligence except following replacement. The findings are not task-specific, as they in general replicate those of previous studies employing different tasks. (Author)

AD-601 828 Div. 28
OTS Price $0.50

Duke Univ., Durham, N. C.
THE SUBJECT ROLE IN SMALL GROUP EXPERIMENTS.
Technical rept. no. 12
by Kurt W. Back, Thomas C. Hood and Mary L. Brehm. 1963, 19p
Contract Nonr1181 11; Grant NIH M5356, Proj. NR177 470

Unclassified report

Descriptors: (*Group dynamics, Behavior), (*Perception (Psychology), Group dynamics), Social psychology, Psychometrics, Models (Simulations).

The social psychological experiment is seen as a system of experimenters and subjects, instead of the classical experimental model of introduction of single variables into a controlled situation. The experiment is a special kind of interpersonal system, very similar to that described as play, namely separate in time and space, uncertain, unproductive, free and governed by rules and make believe. Methodological difficulties occur because experimenters and subjects do not play the same game and because of the overlap of the game system with the part of the subject's life situation. Several studies are described which investigate the effects of the difficulties in taking the subject role. One study showed the different meanings of volunteering for an experiment for men and women. Another set of experiments showed, through physicological measures, the meaning of different phases of the experiment for the subject. Examination of these methodological studies shows the gain for the understanding of experimental results through the use of the play-model. (Author)

AD-601 829 Div. 28
OTS Price $0.50

Duke Univ., Durham, N. C.
IDEA ORIENTATION AND INGRATIATION IN THE INTERVIEW: A DYNAMIC MODEL OF RESPONSE BIAS.
Technical rept. no. 13,
by Kurt W. Back and Kenneth J. Gergen. 1963, 16p
Contract Nonr1181 11, Proj. NR177 740

Unclassified report

Prepared in cooperation with Harvard Univ., Cambridge, Mass.

Descriptors: (*Reaction (Psychology), Group dynamics), (*Group dynamics, Reaction (Psychology)), (*Public opinion), (*Sociometrics), Attitudes, Motivation, Personality, Verbal behavior, Test construction(Psychology), Social communication, Social psychology, Statistical analysis, Data, Measurement, Analysis.

The validity of survey interviews is investigated in order to examine various respondent motivations. A model of interpersonal interaction in the interview is developed by deriving conditions which further or hinder the motivated responses, and specific measures are built into the interview to measure the relative strength of each process. Conclusions resulting from the completed survey are stated in quantitative form, and a method to check on the interview process during the data collection is predicted.

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-601 893 Div. 29, 13, 18
OTS Price $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
REVIEW OF FURNISHINGS FOR POLAR CAMPS.
Technical note.
by G. E. Sherwood. 29 Jun 64, 12p
Proj. Y F015 11 01 001
NCEL N612

Unclassified report

Descriptors: (*Polar regions, Shelters), (*Shelters, Polar regions), Portable, Furniture, Floor coverings, Prefabricated buildings, Armed forces procurement, Armed forces supplies.

A survey was conducted to determine availability of suitable furniture and floor covering for outfitting polar camps. It was determined that lightweight, compact, durable furniture which is both comfortable and attractive is available through commercial sources. Interlocking floor tile which requires no mastic for installation and yet is quite serviceable, is also commercially available. It was concluded that commercially available furnishings have many desirable features which cannot be obtained from standard Navy sources; therefore, outfitting for polar camps should not be limited to standard Navy sources. (Author)

AD-601 896 Div. 29, 13, 18
OTS Price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
POLAR STRUCTURES, THE NCEL FAMILY OF WANIGANS.
Technical rept.
by J. E. Dykins, G. E. Sherwood and C. R. Hoffman.
9 Jun 64, 46p
Proj. YF015 11 01 144
NCEL R309

Unclassified report

Descriptors: (*Polar regions, Shelters), (*Shelters, Portable), Prefabricated buildings, Sleds, Floors, Heating, Ventilation, Design, Fuel tanks.

The need for portable shelters for trail operations, transient field camps, and remote construction areas in polar regions led to the development and evaluation of a family of wanigans. The basic wanigan in this family is the Standard NCEL Sled Wanigan, which is 8 feet wide and 20 feet long. A 10-foot-wide version of this wanigan is called the Extra-Wide NCEL Sled Wanigan. Both of these wanigans must be mounted on bobsleds for mobility. For limited mobility independent of a sled, a heavy-duty floor and skid system was developed for the wanigans. These skid-mounted units are called the Standard NCEL Portable Camp Wanigan and the Extra-Wide NCEL Portable Camp Wanigan. All are of a prefabricated, panelized construction with interchangeable components. The two standard wanigans are air-transportable in a C-130 aircraft; the two extra-wide wanigans must be disassembled for shipment in this aircraft. A basic heating and ventilating kit, an electrical harness, and a side-mounted fuel storage tank were developed for the wanigans. These are adequate for most general applications. Prototypes of both sled wanigans and both portable camp wanigans were tested and evaluated at polar field sites. These tests demonstrated that the sled wanigans are well suited for housing the facilities required on sled train operations in polar regions, and that the portable camp wanigans are well suited for housing those facilities required at transient field camps and isolated construction sites. (Author)

AD-601 902 Div. 29, 14, 16
OTS Price $1.00

Army Chemical Research and Development Labs., Edgewood Arsenal, Md.
BALLISTIC STUDIES IN EYE PROTECTION.
Technical rept.
by Richard L. Williams and George M. Stewart. Nov 63, 31p
CRDL R3194

Unclassified report

Descriptors: (*Ammunition fragments, Eyeglasses), (*Eyeglasses, Ammunition fragments), Plastic lenses, Penetration, Laminated glass, Wounds and injuries, Glass, Lenses, Military personnel, Fragmentation, Optic nerve, Cornea, Body armor, Acrylic resins, Eye.

This work was undertaken to evaluate ballistically the resistance to penetration of optical lenses and rabbit eyes by lead and steel BB's. Plastic CR39 lenses were tested, in addition to several types of glass lenses. On the basis of the evaluations, it was concluded that: the plastic lenses were the most resistant to both missiles. The 9-diopter lenses were, in general, superior to the 12-diopter ones, and the lead BB deformed against all lenses to varying degrees, while the steel BB deformed very little. For tests with eyes, the ballistic limit for the steel BB was higher than that for the lead BB, which is the reverse order to that for lenses. Neither the lead nor the steel BB deformed upon striking the eye. The unshielded eye, in some cases, may provide itself better protection against impacts by missiles below its ballistic limit than can be obtained from some lenses. Missile impacts below the ballistic limit of the eye, however, could cause injuries ranging from minor corneal contusions to internal structural damage. Eye armor is a definite asset to the protection of eyes, and any optically suitable material possessing encouraging ballistic properties, such as plastic CR39, could be considered a valid candidate. (Author)

AD-602 124 Div. 29
OTS Price $6.00

IIT Research Inst., Chicago, Ill.
SHELTER EQUIPMENT PLANNING GUIDELINES.
Final rept.,
Jun 64, 414p
Contract OCD OS62 195, Proj. 1532A

Unclassified report

Descriptors: (*Shelters, Survival), Radioactive fallout, Survival kits, Electric power production, Power supplies, Air conditioning equipment, Ventilation, Water supplies, Wastes (Sanitary engineering), Closed ecological systems, Disposal, Communication systems, Fire safety, Noise, Food, Medicine, Radiation monitors, Dosimeters.

The objective of the study is to establish a series of guidelines for community shelter equipment and supply planning. Specifically, the study was designed to determine the type of equipment and supplies which are necessary for human survival within the protective area of a community fallout shelter and the manner in which the equipment and supplies should be maintained before and during shelter occupancy.

AD-602 249 Div. 29, 3, 16
OTS Price $0.50

Walter Reed Army Medical Center, Washington, D. C.
DESIGN OF AN OPTICAL INSERT TYPE 3R1.
Rept. for Jan 63-May 64
by Albert B. Coleman. Jun 64, 10p
Proj. 3A012501A82 03
WRAMC TR6404

Unclassified report

columns to be searched). While accuracy was high under all conditions of search, there were significant increases in search time as a function of changes in display characteristics--increase from 10 to 25 lines of information, pertinent information placed near bottom of the slide, increase in number of columns to be searched. However, search time for high density of information was slightly shorter than for medium and low densities. (Author)

AD-602 079 Div. 28, 30
OTS Price $1.50

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
FURTHER EXPERIMENTS ON COMPUTER-AIDED LEARNING OF SOUND IDENTIFICATION.
Technical rept.
by John A. Swets, Judith R. Harris, Linda S. McElroy and Harry Rudloe. Apr 64, 53p
Contract N61339 789
NAVTRADEVCEN 789 2

Unclassified report

Descriptors: (*Teaching machines, Digital computers), (*Learning, Perception (Psychology)), Sound, Programming (Computers), Performance (Human), Education, Experimental data. Laboratory equipment, Communication theory.

In experiments reported here the subject was able to choose freely, at any time, among the various instructional procedures, and to regulate the introduction of new materials. One of these experiments employed an electric typewriter as the means of communication between subject and computer; the other employed an oscilloscope display and light pen in an attempt to provide a moreeffective mechanism for response and feedback of results. Granting to the subject control of the training procedure led to no better final performance than that observed when the experimenter determined the course of the lesson, and the scope-and-light-pen device led to no better performance than the typewriter. Further analysis of the results provided detailed support of the earlier conclusions: for example, success was positively correlated with the proportion of time spent on simple exposure to the sound-label pairs, and negatively correlated with the proportion of time spent in active responding, receiving feedback, and making second tries. Three variables related to streamlining of the task and temporal contiguity of sound and label account for nearly 100% of the variance. (Author)

AD-602 178 Div. 28, 1, 30
OTS Price $1.00

Aeronautical Computer Lab., Naval Air Development Center, Johnsville, Pa.
APPLICATION OF HARMONIC ANALYSIS IN A STUDY OF TRACKING PERFORMANCE IN THE TV-2 AIRCRAFT AND IN CENTRIFUGE AND STATIONARY SIMULATIONS OF THAT AIRCRAFT.
Technical rept.,
by H. G. Tremblay, John L. Brown, and A. Futterweit.
30 Apr 64, 36p
Task FR70 4 01
NADC-AC 6406

Unclassified report

Descriptors: (*Flight simulators, Centrifuges), (*Centrifuges, Flight simulators), Special purpose computers, Aircraft, Simulators, Attitude control systems, Pilots, Psychomotor tests, Harmonic analysis, Graphics.

Piloting performance in a continuous tracking task was studied in an aircraft, in human centrifuge simulations controlled by a computer simulation of the aircraft, and in a stationary simulation. Continuous records of elevator and aileron control surface deflections were subjected to a power spectral density analysis. Results indicate that there is a reduction in the contributions of high frequency components of power, successively, from the static simulation to the centrifuge simulations, to the aircraft itself. The power spectral density function for performance in a centrifuge simulation is more like that for the aircraft than is the power spectral density function in a static simulation. (Author)

AD-602 205 Div. 28
OTS Price $1.60

Civil Aeromedical Research Inst., Oklahoma City, Okla.
SIZE CUES AND THE ADJACENCY PRINCIPLE,
by Walter C. Gogel. Nov 63, 12p
CARI 63 28

Unclassified report

Descriptors: (*Space perception, Psychometrics), Visual perception, Reaction (Psychology), Physical properties.

The purpose of the study was to apply the adjacency principle to the perception of relative depth from size cues. In agreement with the adjacency principle, it was found that the size cue between adjacent objects was more effective than the size cue between displaced objects in determining the perceived relative depth position of objects. An additional, although minor, factor concerned with task-set was tentatively identified as contributing to the perception of depth from size cues. (Author)

AD-602 265 Div. 28
OTS Price $0.50

Human Engineering Lab., Aberdeen Proving Grounds, Md.
MAXIMUM ACCEPTABLE STEADY STATE NOISE LEVEL FOR ARMY MATERIEL COMMAND EQUIPMENT.
by Robert F. Chaillet. Jun 64, 8p
HEL S1 63A; HEL S1 63, superseded

Unclassified report

Descriptors: (*Noise, Human engineering), (*Human engineering, Army equipment), (*Army equipment, Human engineering), Hearing, Damage, Sound, Army personnel, Standards.

This standard establishes the maximum acceptable steady state noise level permitted at personnel occupied spaces of equipment designed, developed or procured by AMC.

AD-602 266 Div. 28, 16
OTS Price $0.50

Walter Reed Army Medical Center, Washington, D. C.
AN EVALUATION OF GROUP PSYCHOTHERAPY WITH INDIVIDUAL FAMILIES AS THE INTEGRAL UNITS.
Final rept. for 1 Jul 60-30 Jun 64,
by Carl G. Lauterbach and William Vogel. 30 Jun 64, 14p
Proj. 6 60 01 002

Unclassified report

Descriptors: (*Psychiatry, Military personnel), (*Group dynamics, Behavior), Adolescents, Reaction (Psychology), Adjustment (Psychology), Social psychology, Abnormal psychology, Males, Aptitude tests, Psychometrics, Projective techniques, Social communication, Humans, Bibliographies.

The program developed in the treating of 40 families with problem adolescent sons by family group therapy is outlined. The results and methods used have been published in five reports. These publications are listed as part of the bibliographic reference material. Preparation of two other manuscripts for publication is now in progress.

30. RESEARCH AND RESEARCH EQUIPMENT

AD-601 720 Div. 30, 2
OTS Price $2.50

Informatics, Inc., Sherman Oaks, Calif.
PHOTO INTERPRETATION PROGRAMS FOR RW 400 COMPUTING PROGRAMS.
Final rept.
May 64, 110p
Contract AF30 602 3106, Proj. P040A
RADC TDR63 544

Unclassified report

Descriptors: (*Photo interpretation, Programming (Computers)), (*Programming (Computers), Photo interpretation), (*Digital computers, Input-output devices), Punched cards, Programming languages, Design, Computers, Data, Mapping, Geography.

This document provides basic instruction to the users of the RW 400 computer as to system methodology. It also provides detailed computer programming information to facilitate program change and maintenance, step by step operating procedures, as well as background equipment reference for the user who desires it. The programs are contained on punched computer cards located at the Rome Air Development Center's Experimental Facility. (Author)

AD-601 742 Div. 30
OTS Price $1.00

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION.
Rept. no. 15 (Quarterly progress rept. no. 3) 1 Jan-31 Mar 64, by A. E. Brain, D. J. Hall, and J. H. Munson. Apr 64, 34p
Contract DA36 039AMCO3247E, continuation of Contract DA36 039sc78343, Projs. 3A99 22 001, 4565

Unclassified report

Descriptors: (*Graphics, Data processing systems), (*Information retrieval, Graphics), (*Pattern recognition, Graphics), (*Data processing systems, Military requirements), Digital computers, Coding, Special functions (Mathematical), Computer logic, Computers, Tests.

Several aspects of the practical procedures for using MINOS II are examined. The SDS 910 computer has been selected for use with MINOS II on the basis of an over-all evaluation of characteristics. Some guidance is given on methods of input and output coding. The parity functions have been found useful for testing and check-out. (Author)

AD-601 749 Div. 30
OTS Price $9.60

Systems Research Center, Case Inst. of Tech., Cleveland, Ohio.
AN ELEMENTARY INFORMATION PROCESSOR FOR OBJECT RECOGNITION,
by James C. Pennypacker. May 63, 111p, SRC 30 I 63 1
Grant GP658, Grant AF AFOSR125 63

Unclassified report

Descriptors: (*Programming (Computers), Pattern recognition), (*Artifical intelligence, Digital computers), (*Pattern recognition, Digital computers), Computer logic, Data processing systems, Identification.

A Concept is defined to be a class of objects whose members can be distinguished by processing its properties. A Property is defined to mean a partition of the set of all objects into disjoint classes. The concept is described by a Conception, which is a list structure. The conception of a concept is built up from elementary conceptions by a recursive process and is an abbreviated form of the description list structure described by R.B. Banerji in an earlier paper. A processor, which consists of a series of computer flow charts, is described. The processor is capable of forming conceptions of known and new concepts and is capable of processing information relevant to these concepts. In addition, the processor is capable of elementary learning. (Author)

AD-601 758 Div. 30, 17
OTS Price $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRONIC EYE.
11 May 64, 5p
FTD TT64 154; TT 64 11797

Unclassified report

Unedited rough draft trans. from Berliner Zeitung (East Germany) 1963, 8 Dec, suppl., p. 4.

Descriptors: (*Electron microscopes), Metallography, Metallurgy, Surface properties, East Germany.

An electronic emission microscope, characterized by its high resolving power which can currently be attained by surface pictures is discussed.

AD-601 764 Div. 30, 15, 25
OTS Price $2.50

University of Southern California, Los Angeles. Engineering Center.
RESEARCH IN OPTICAL COHERENCE AND NONLINEAR ESTIMATION THEORY.
Final rept.,
by Gregory O. Young, Clarence Giese, and Robert S. Macmillan. Dec 63, 116p USCEC102 101, USCEC EE34
Grant AF AFOSR188 63, Proj. 9768
AFOSR 64 1141

Unclassified report

Descriptors: (*Optical phenomena, Communication theory), (*Nonlinear differential equations, Dynamics), Electromagnetic waves, Statistical functions, Monochromatic light, Optics, Taylor's series, Vector analysis, Programming (Computers), Compilers, Matrix algebra, Functions, Equations, Atmosphere entry, Trajectories, Reentry vehicles.

The theory developed in this report applies to any type of process or source. It is shown that the coherence properties of electromagnetic waves bear a direct relationship to their information carrying capacity. A number of examples are worked out of the coherence properties of monochromatic and polychromatic waves emitted by either point sources or extended objects. The effect of aperture limitation on the coherence properties of the image of the above sources is also investigated. Part II is concerned with the estimation of the dynamic states of a nonlinear differential equation which is quasi-linear in the vector function $x = f(x)$. To demonstrate the nonlinear estimation procedure, an algorithm was programmed for a digital computer which solves the equations for estimation of the dynamic states of an unguided reentry space vehicle.

Descriptors: (*Protective masks, Optical equipment), (*Eyeglasses, Protective mask facepieces), Vision, Optical equipment components, Plastics, Design.

The goal of the research project was to design and develop a preprototype model of an optical insert that can be used as a vision corrective device when worn within CBR protective masks. (Author)

Descriptors: (*Laboratory equipment, Hypervelocity projectiles), (*Impact shock, Spacecraft), (*Hypervelocity projectiles, Laboratory equipment), Guided missiles, Materials, Velocity, Aluminum, Plasma physics, Hydrodynamics, Test equipment, Shock waves, Photographic equipment, Cratering, Spark shadowgraph photography, Equations, Gas flow, Copper, Lead, Measurement, Meteorites, Terminal ballistics.

Reliable diagnostic techniques were developed to measure the mass and velocity of hypervelocity particles projected by an exploding-foil gun. Velocities were increased from 20,000 ft/sec to better than 35,000 ft/sec as a result of improved gun design and modifications to the energy system, including the installation of an electrically triggered switching system. The Electro-Optical 6-frame Kerr cell camera was also evaluated. A program to measure the electrical parameters of the system and to correlate them with photographic data was instituted, and a theoretical model for the partition of impact energy of a hypervelocity particle was begun. Once sufficient data have been taken with the improved particle projection and diagnostic technique, a more comprehensive theoretical program will be instituted. (Author)

AD-601 892 Div. 30, 14
OTS Price $ 1.00

Naval Civil Engineering Lab., Port Hueneme, Calif.
PRELIMINARY EXAMINATION OF MATERIALS EXPOSED ON STU I-3 IN THE DEEP OCEAN, (5640 FEET OF DEPTH FOR 123 DAYS).
Technical note.
by Fred M. Reinhart. Jun 64, 34p
Proj. Y F015 01 01 001c
NCEL N605

Unclassified report

Descriptors: (*Test facilities, Underwater), (*Environmental tests, Pacific Ocean), Liquid immersion tests, Oceans, Test equipment, Materials, Aluminum alloys, Copper alloys, Nickel alloys, Titanium alloys, Steel, Iron, Plastics, Elastomers, Concrete, Degradation, Visual inspection, Data.

Preliminary results of corrosion of materials, based solely upon visual examinations, exposed in 5640 feet of water in the Pacific Ocean for 123 days showed only a few cases of deterioration different from those usually found in moving surface sea water. The Clad layers on two aluminum alloys corroded at a much faster rate than normal for surface sea water. The lace-work and undersurface types of attack on certain stainless steels appear to be similar to types of attack by stagnant surface sea water; this could be attributed to low oxygen content as well as lack of a significant movement of deep sea water. Other materials, both metallic and nonmetallic, were not seriously deteriorated and some showed absolutely no evidence of deterioration. (Author)

AD-601 914 Div. 30
OTS Price $0.50

Army Medical Research and Nutrition Lab., Denver, Colo.
A SIMPLE AND VERSATILE PUNCH CARD SYSTEM FOR BIBLIOGRAPHIC USE.
by Gilbert A. Leveille, Howerde E. Sauberlich, and Wayne C. Goad. 26 Dec 63, 10p
Task 16
AMRNL 281

Unclassified report

Descriptors: (*Bibliographies, Information retrieval), (*Punched cards, Bibliographies), Indexes, Subject indexing, Classification, Coding.

A punch card system is described which should find application for general or specific bibliographic use. The system enables the individual to file a reference by subject, author and year. A reference can be cross-indexed in as many as four subject categories and up to 39,999 subjects can be indexed. The cards can be filed randomly and, consequently, the system can be maintained with a minimum of labor. (Author)

AD-601 969 Div. 30, 25
OTS Price $0.75

Airborne Instruments Lab., Inc., Deer Park, N. Y.
SOLID-STATE FERROELECTRIC ACCELEROMETER.
Interim rept. no. 2, 4 Feb-4 May 64
by M. L. Wright and M. M. Freundlich. 12 Jun 64, 24p
Contract NOw64 0093C

Unclassified report

Descriptors: (*Accelerometers, Design), (*Ferroelectric crystals), Optics, Light, Sources, Focousing, Polarization, Resolution, Optical equipment, Photomultipliers, Electron optics, Potassium compounds, Borium compounds, Hydrogen, Lead compounds.

The design and operation of a fringe-counting accelerometer breadboard and a multiple-pass accelerometer breadboard is given. Single fringe-resolving systems are described. A crystal test fixture described in a previous report (AD-432 049) is further elaborated upon. Finally, data resulting from the measurement of crystals with curie points is presented.

AD-601 981 Div. 30, 15
OTS Price $0.75

Hudson Labs., Columbia Univ., Dobbs Ferry, N. Y.
ALGORITHMS FOR ANALYSIS AND TRANSLATION OF A SPECIAL SET OF COMPUTABLE MATHEMATICAL FORMS.
Technical rept. no. 113
by M. Klerer and J. May. Oct 63, 26p CU 138 64ONR266Phys
Contract Nonr266 84

Unclassified report

Descriptors: (*Mathematics, Programming (Computers)), (*Programming (Computers), Mathematics), Character recognition, Data, Mathematics, Magnetic tapes, Printing, Compilers, Sequences.

The coding algorithms for the analysis and translation of the sequential paper tape code produced in typing a program, that are referenced in Klerer, M. and May, J., An experiment in a user oriented computer system, Comm. ACM 7, 5 (May 1964), 290-294, are given. Originally, this was an appendix to the above paper but, for reasons of space, it was decided to issue the appendix as a separate document. The correspondence between the two-dimensional typewritten document and the one-dimensional paper tape code string is unique only in the sense that reading the paper tape code will regenerate the document exactly as originally typed, errors and overtyping included. The translating algorithm reads the particular tape and assigns a unique storage location in memory which in fact has a one-to-one correspondence to the strokes of the actual two-dimensional typewritten document. Thus, all overtyping strokes actually enter the same memory cell, and erasures are distinguished from reasonable overtypes (e.g.,A) by flag bits.

AD-601 987 Div. 30
OTS Price $3.50

Office of Naval Research, Washington, D. C.
THE LOGICAL DESIGN OF A MULTICHANNEL DEVICE FOR THE RETRIEVAL OF INFORMATION.
by Vance R. Wanner. Apr 64, 208p
ONR ACR93

Unclassified report

AD-601 794 Div. 30, 8
OTS Price $2.25

Systems Research Group, Inc., Mineola, N. Y.
MILITRAN REFERENCE MANUAL.
Technical rept.
Jun 64, 84p
Contract Nonr2936 00, Projs NR276 001, 2801 Task 280101
ESD TDR64 390

Unclassified report

Descriptors: (*Language, Data processing systems), (*Programming languages), Programming (Computers), Simulation, Input-output devices, Compilers, Digital computers, Information retrieval, Computer logic, Control sequences, Reading machines, Character recognition, Instruction manuals, Operations research, Coding.

The Militran Reference Manual is one of three technical reports which constitute a complete description and instructions for using the Militran language in computer programming of simulation problems. Topics discussed in the manual include: (1) general language characteristics; (2) structure; (3) expressions; (4) processing; (5) input-output; (6) control; and (7) compilation.

AD-601 795 Div. 30, 8
OTS Price $2.00

Systems Research Group, Inc., Mineola, N. Y.
MILITRAN OPERATIONS MANUAL FOR IBM 7090-7094.
Technical rept.
Jun 64, 77p
Contract Nonr2936 00, Projs. NR276 001; 2801,
Task 280101,
ESD TDR64 389

Unclassified report

Descriptors: (*Language, Data processing systems), (*Programming languages), Programming (Computers), Simulation, Input-output devices, Compilers, Digital computers, Information retrieval, Computer logic, Control sequences, Reading machines, Character recognition, Instruction manuals, Operations research, Coding.

The Militran Operations Manual for IBM 7090-7094 is one of three technical reports which constitute a complete description and instructions for using the Militran language in computer programming of simulation problems. In this report the features of the 7090 Militran Processor and instructions for its use are provided. An overall view of the processor and its operation is given along with details of processor operation which apply to the programmer and machine operator. Full information necessary for compilation, assembly, and execution of programs written in the Militran language is also included.

AD-601 796 Div. 30, 8
OTS Price $3.50

Systems Research Group, Inc., Mineola, N. Y.
MILITRAN PROGRAMMING MANUAL.
Technical rept.
Jun 64, 205p
Contract Nonr2936 00, Projs. NR276 001, 2801,
Task 280101
ESD TDR64 320

Unclassified report

Descriptors: (*Language, Data processing systems), (*Programming languages), Programming (Computers), Simulation, Input-output devices, Compilers, Digital computers, Information retrieval, Computer logic, Control sequences, Reading machines, Character recognition, Instruction manuals, Operations research, Coding.

The Militran Programming Manual is one of three technical reports which constitute a complete description and instructions for using the Militran language in computer programming of simulation problems. Topics discussed in this report include: (1) a definition and sampling of the Militran language; (2) general language characteristics; (3) basic Militran environment; (4) programming in Militran: arithmetic and logical processing; (5) control statements; (6)lists and list processing statements; (7) events; (8) procedures; and (9) input-output statements.

AD-601 802 Div. 30
OTS Price $4.00

Army Research Office, Durham, N. C.
RESEARCH IN PROGRESS DURING CALENDAR YEAR 1962.
Annual rept. no. 2.
1962, 275p

Unclassified report

Descriptors: (*Scientific research, Reports), Physics, Army research, Chemistry, Mathematics, Engineering, Metallurgy, Ceramic materials, Indexes.

AD-601 849 Div. 30
OTS Price $2.00

Stanford Research Inst., Menlo Park, Calif.
LINEAR SEPARABILITY OF SIGNAL SPACE AS A BASIS FOR ADAPTIVE MECHANISMS.
Final rept.,
by N. J. Nilsson. May 64, 78p
Contract AF30 602 2943, Proj. 5581, Task 558104
RADC TDR64 145

Unclassified report

Descriptors: (*Pattern recognition, Machines), Input-output devices, Artificial intelligence, Computer logic, Bionics, Training, Theory.

The report reviews the research results of the program entitled Linear Separability of Signal Space as a Basis for Adaptive Mechanisms. The major contributions of this program were two fold: (1) the notion of discriminant functions was employed in constructing a framework for organizing past and present knowledge into a basis for further theoretical research on trainable pattern classifying machines, and (2) some significant new results were obtained on trainable pattern classifying machines. The specific research efforts reported fall into the following categories: (1) investigation of the properties of various families of discriminant functions to be used by a pattern dichotomizer; (2) investigation of various network structures for the implementation of useful families of discriminant functions; and (3) investigation of various training rules to be used in selecting the appropriate discriminant function for a pattern dichotomizer. (Author)

AD-601 880 Div. 30, 12, 22
OTS Price $1.50

Technical Operations, Inc., Burlington, Mass.
EFFECTS OF HYPERVELOCITY IMPACTS ON MATERIALS,
by V. E. Scherrer, M. Beran, H. Stevens, and R. W. O'Neil. Jun 64, 56p
Contract AF33 616 8423, Proj. 7360, Task 736006
ML TDR64 161

Unclassified report

AD-602 073 Div. 30, 16
OTS Price $1.25

RAND Corp., Santa Monica, Calif.
A DIGITAL-COMPUTER MODEL OF NERVE-CELL FUNCTIONING.
by Donald H. Perkel. Jun 64, 49p RM-4132NIH
Grant PHS GM09608 03

Unclassified report

Descriptors: (*Nerve cells, Bionics), (*Mathematical models, Nerve cells), (*Bionics, Nerve cells), Cybernetics, Programming (Computers), Digital computers, Simulation, Nervous system, Cells (Biology), Cytology.

A mathematical model of nerve-cell functioning is described. This model is embodied in digital-computer programs which simulate the behavior of nerve cells, their interconnecting fibers, and extrinsic sources of impulses. The simulation utilizes a continous time parameter. Investigations using this model have been conducted in close collaboration with experimental neurophysiologists. The physiological content of the model is discussed by tracing a nerve impulse as it is conducted along an axon, and as it occasions the release of a transmitter substance at a synapse, interacts with the transmembrane potential of the postsynaptic cell, undergoes spatial and temporal integration with other postsynaptic potentials, and possibly contributes to the firing of the cell, which undergoes absolute and relative refractory periods, and propagates an impulse along its own axon. (Author)

AD-602 074 Div. 30
OTS Price $1.25

RAND Corp., Santa Monica, Calif.
JOSS: SCENARIO OF A FILMED REPORT.
by C. L. Baker. Jun 64, 50p RM-162PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Data processing systems, Motion pictures), Systems engineering, Programming (Computers), Computer operators, Typewriters, Communication systems, Programming languages, Computers.

Report on a film and discussion of the Rand Johnniac Open-Shop System, an on-line time shared application of the Rand Johnniac Computer.

AD-602 077 Div. 30, 2,25
OTS Price $0.75

Ohio State Univ., Columbus. Research Foundation.
THE DESIGN AND CONSTRUCTION OF A LUMINOUS SHOCK TUBE FOR SPECTROSCOPIC INVESTIGATIONS OF HIGH-TEMPERATURE GASES.
Final rept.,
by Paul L. Byard, Ronald E. Roll, and Arne Slettebak.
Jan 64, 25p
Contract AF19 604 4055, Projs. 8635; 845, Task 863503
AFCRL 64 257

Unclassified report

Descriptors: (*Shock tubes, Design), (*Gases, Spectroscopy), (*Spectrum analyzers, Design), Astrophysics, Test facilities, High-temperature research, Line spectrum, Continuous spectrum, Atomic spectroscopy, Absorption spectrum, Gas ionization, Shock waves.

The shock tube and auxiliary equipment are described in AD-410 569. Modifications and additions to the equipment are discussed. The theory of the formation of spectrum lines, applicable to shock-tube spectroscopy, is developed. A temperature behind the reflected shock is computed by a line reversal method which is in good agreement with previously measured excitation temperatures. (Author)

AD-602 096 Div. 30
OTS Price $2.50

Digital Computer Lab., Univ. of Illinois, Urbana.
GENERAL THEORY OF MOST EFFICIENT CODES.
by Yasuo Komamiya. 9 Jun 64, 109p ILU-DCL 163

Unclassified report

Descriptors: (*Programming (Computers), Theory), (*Binary arithmetic, Mathematical logic), (*Matrix algebra, Vector analysis), Real numbers, Algebras.

In this paper, the number of most efficient binary codes and the construction methods are discussed in general, where the most efficient binary codes mean codes with a minimum Hamming distance of p. The purpose of the paper was to obtain maximum m and the value of each x sub ij. Discussed are: (1) A theorem which plays an important role in the coding problem; (2) The matrix H(n, p); (3) The characteristic values of H(n, p); (4) Some properties of the independence of vectors; (5) A solution under some conditions (group code condition implies these conditions; accordingly, group code is a special case of these conditions); (6) One method of general solution; and (7) Application of Boolean algebra in finding a general solution.

AD-602 110 Div. 30, 5, 8
OTS Price $2.50

General Dynamics/Electronics, Rochester, N. Y.
ADAPTIVE PROGRAMMING TECHNIQUES FOR CIRCUIT DESIGN.
Final rept.
Jun 64, 104p
Contract AF30 602 2961, Proj. 5581, Task 558104
RADC TDR64 194

Unclassified report

Descriptors: (*Pattern recognition, Computer logic), (*Adaptive communication systems, Pattern recognition), Circuits, Design, Decision theory, Statistical functions, Equations, Digital systems, Analog systems, Programming (Computers), Communication theory, Probability, Sampling.

Efforts to develop pattern recognition techniques in general, and in particular, the application of threshold logic devices to pattern recognition are reported. The threshold logic equation has been generalized to handle pattern observables which are continuous variables. Emphasis was placed on the classification with minimum errors in the unknown patterns as opposed to the learning patterns used to design the system. (Author)

AD-602 187 Div. 30, 25
OTS Price $0.75

American Meteorological Society, Boston, Mass.
DEVICE FOR MEASURING THE SIZE SPECTRUM OF SPHERICAL PARTICLES AND FOG DROPLETS,
by V. I. Golikov. Jan 64, 24p AmMetSoc T-R-422
Contract AF19 628 3880
TT 64 11827

Unclassified report

Ustanovka dlya Izmereniya Spektra Razmerov Sfericheskikh Chastits i Kapel' Tumanov, trans of Glavnaya Geofizicheskaya Observatoriya, Leningrad. Trudy (USSR) 1961, no. 109[171], p. 76-89.

Descriptors: (*Particle size, Optical analysis), (*Photometers, Design), Spheres, Particles, Water, Drops, Fog, Optical properties, Measurement, Optical instruments, Errors, Reduction, USSR.

Descriptors: (*Information retrieval, Digital computers), (*Computer logic, Digital computers), Multiple operation, Input-output devices, Data storage systems, Data processing systems, Design, Search theory.

The paper outlines a preliminary logical investigation of a data retrieval system in which word bits are handled in parallel and in which the interrogation plan is not constrained to conform necessarily to a preordained set of interrogation keys. Although the system is generally described, attention is focused primarily upon the heart of the system, a comparator unit whose purpose is to extract from the larger body of stored data that which is germane to any specific set of interrogation criteria. Since the treatment is not oriented in the direction of any unique usage, the approach is quite general and, furthermore, does not extend into electronic packaging or circuiting. (Author)

AD-602 034 Div. 30, 13
OTS Price $3.00

Massachusetts Inst. of Tech., Cambridge.
TECHNIQUES AND MATERIALS IN THE MODELING OF REINFORCED CONCRETE STRUCTURES UNDER DYNAMIC LOADS.
by Harry G. Harris, Peter C. Schwindt, Imad Taher, and Stuart Werner. Dec 63, 167p MIT R63 54, DSR-9384
Contract NBy32228

Unclassified report

Descriptors: (*Reinforced concrete, Models (Simulations)), (*Structures, Reinforced concrete), (*Loading (Mechanics), Reinforced concrete), Stresses, Mathematical analysis, Civil engineering, Model tests, Reinforcing materials, Wire, Cylindrical bodies, Beams (Structural), Test methods, Test equipment, Compressive properties, Tensile properties, Plastics, Blast, Simulation.

The overall problem of reinforced microconcrete models is examined from the point of view of clarifying the basis of model scale, aggregate gradation, size of test specimen and fabricating techniques. The problems dealt with in this report include: (1) Design of control specimens - shape effect, size effect. (2) Design of the model mix - aggregate gradation, water cement ratio. (3) Testing of control specimens - strain rate, type of machine used. (4) Strength properties - unconfined compression strength, flexural strength, strength of reinforcement, bond characteristics, shear strength, Poisson's ratio. (5) Fabrication of models. In addition, supplementary information is provided concerning the use of plastics as a model material for reinforced concrete, and the design of a dynamic loading machine to test small scale models.

AD-602 036 Div. 30, 27
OTS Price $5.00

Naval Boiler and Turbine Lab., Philadelphia, Pa.
INSTRUMENT STANDARDS.
11th ed.
ed. by E. L. Lewis. 1 Jun 64, 305p

Unclassified report

Descriptors: (*Instrumentation, Standards), (*Naval research laboratories, Instrumentation), Boilers, Turbines, Performance (Engineering), Measurement, Thermocouples, Calorimeters, Pressure gages, Meters, Materials, Specifications, Instruction manuals.

The Standard Plans contained in this binder constitute Naval Boiler and Turbine Laboratory Instrument Practice as of the Date of Issue. They are subject to revision without notice to holders of this binder. They represent only repetitive items, each test measurement system is designed according to its own requirements, the standards being used where applicable. Beginning with the 11th Edition the Standards specifically concerned with Flow Measurement have been removed from this volume and are being issued as a separate publication. The assembly of these standards into a separate volume has been done to facilitate their use by those whose primary area of interest is in the field of fluid flow measurement and calculation. (Author)

AD-602 065 Div. 30
OTS Price $2.25

RCA Defense Electronic Products, Camden, N. J.
RCA PRINT READER INVESTIGATION AND TESTS.
Final rept.,
by W. J. Hannan, T. W. Olsen, J. F. Schanne, G. T. Burton, and W. F. Heagerty. Oct 62, 85p
Contract AF30 602 2560, Proj. 4594, Task 45820
RADC TDR62 578

Unclassified report

Descriptors: (*Reading machines, Operation), (*Character recognition, Reading machines), Scanning, Printing, Electronic scanners, Feasibility studies, Fiber optics, Electron optics, Numbers, Language, Photoelectric effect, Correlation techniques, Performance (Engineering).

The objective of this program was to determine the potential performance of the RCA electro-optical reading machine. Primary emphasis was placed on evaluating the ability of the machine to recognize complete English and Russian fonts. This evaluation was accomplished by extending the capacity of the RCA experimental machine and measuring the correlation ratios of the signals from the recognition channels while a set of test documents was read. The correlation ratios measured indicated the ability of the machine to distinguish among the characters in English and Russian fonts. The results of these tests proved that the electro-optical print reading method is suitable for reading both fonts. The results also indicated that reliable multifont operation can be realized. The feasibility of using an electronic flying-spot scanner to scan book-size lines of print was also investigated. To achieve this objective, a sectionalized scanning technique was developed and successfully demonstrated. It enabled exceptionally high resolution to be realized without the need for a special kinescope. The report contains a detailed description of the operating principles of the RCA machine, results of the correlation ratio tests, a description of the sectionalized scanner, and a description of a number of techniques for extending the performance of this machine. (Author)

AD-602 067 Div. 30, 8, 25
OTS Price $0.75

IBM Data Systems Div., Kingston, N. Y.
CRYOGENIC ASSOCIATIVE PROCESSOR PLANE TEST AND EVALUATION.
Final technical rept. for 15 Aug-15 Dec 63,
by G. B. Rosenberger. Jun 64, 30p
Contract AF30 602 3175, Proj. 5581, Task 558108
RADC TDR64 26

Unclassified report

Descriptors: (*Cryogenic storage devices, Research program administration), Manufacturing methods, Performance (engineering), Data processing systems, Superconductivity, Circuits, Films, Polymers, Vapor plating, Vacuum apparatus, Capacitors, Lead, Tin, Metal films, Silicon compounds, Monoxides, Electric insulation, Electron bombardment.

The fabrication and testing of a Cryogenic Associative Processor are described in this report. The processor consisted of 2350 cryotrons interconnected to form ten 12-bit wwords of associated storage. The cryotrons and the necessary control circuitry were vacuum-deposited on a four and a half by four and a half inch substrate. Polymer type insulation was used. The fabrication process and the reasons for limited success of the program are discussed in detail. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-602 211 Div. 31
OTS Price $2.60

David Taylor Model Basin, Washington, D. C.
CALCULATED MODES AND FREQUENCIES OF HULL VIBRATION OF USS GEORGE WASHINGTON (SSBN 598).
Research and development rept.,
by Barbara H. Gesswein and Fred Moses. Nov 60, 28p
Proj. S F013 1101
DTMB 1464

Unclassified report

Descriptors: (*Submarine hulls, Vibration), Mechanical properties, Frequency, Shafts, Ballistic missile Submarines, Nuclear powered vessels.

Normal mode shapes, natural frequencies, and bending moments of vertical flexural vibration and of longitudinal bartype vibration of the hull and of the shafting system were calculated for USS George Washington (SSBN 598). The methods used in evaluating the parameters necessary for the calculations were described. (Author)

AD-602 238 Div. 31, 26
OTS Price $1.75

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF METAL LAMINATES WITH HIGH DAMPING CAPACITY.
Progress rept. no. 3,
by R. M. Antonucci. 13 Jul 64, 64p
Proj. S. F013 11 01, Task 1353
MINS 94 53

Unclassified report

Descriptors: (*Sandwich panels, Manufacturing methods), (*Submarine hulls, Sandwich panels), Laminates, Damping, Metals, Steel, Synthetic rubber, Adhesives, Bonding, Molding, Machining, Cold working, Elasticity, Vibration, Ship structural components.

This report describes techniques developed for the manufacture of flat panels three feet by four feet in size and having a net thickness of steel of 3/8 inch for use as fairwater and superstructure plates on submarines. The panels consisted of six 1/16-inch thick layers of mild steel interleaved with 10-mil thick layers of a Neoprene ILA compound. Various methods of cutting, machining and forming the panels to desired contours were investigated. It was found that the panels can be cut with a band-saw to desired sizes and machined with the usual cutting tools providing the panels are kept cool during these operations. It was also found that the panels could be bent satisfactorily only with radius dies and then only if the panels were totally enclosed within mating dies. The minimum radius of curvature to which panels of practical size could be bent was 48 inches. Bending of the panels to this curvature had no significant effect on the bond between the steel laminae and interlayer material or on damping behavior. (Author)

AD-602 291 Div. 31, 9
OTS Price $4.60

David Taylor Model Basin, Washington, D. C.
WAKE ANALYSIS OF SHIP MODELS, SINGLE-SCREW DE-TYPE,
by H. M. Cheng and J. B. Hadler. Jun 64, 46p
DTMB 1849

Unclassified report

Descriptors: (*Wake, Ship models), (*Destroyer escorts, Model tests), Ship models, Propellers (Marine), Design, Ship structural components, Velocity, Cavitation, Vibration, Loading (Mechanics), Data, Performance (Engineering), Mathematical analysis.

This report presents the results of an analysis of the wake of single-screw DE-type ship models using the IBM-7090 Computer. The data presented are the interpolated longitudinal and tangential velocity distributions, their computed mean values, the harmonic contents of these velocity components, the resultant inflow velocity distribution, and the advance angles and their variations. Also included are the calculated volumetric wake velocities. (Author)

A laboratory device is described for measuring the size spectrum of spherical particles of powder (plane models of sol) and water droplets (droplets in a thin oil film, and a steam fog in a cloud chamber and investigate possible sources of error and means of reducing them. (Author)

AD-602 222 Div. 30, 18, 32
OTS Price $0.75

Moore School of Electrical Engineering, Univ. of Pennsylvania, Philadelphia.
ON A STUDY OF INFORMATION STORAGE AND RETRIEVAL.
Interim technical rept.,
by D. S. Sharp and J. E. McNulty.
15 May 64, 22p MSEE 65 01
Contract Nonr551 40

Unclassified report

Descriptors: (*Information retrieval, Inventory control), (*Inventory control, Information retrieval), (*Operations research, Management planning), Naval research, Management engineering, Human engineering, Real time, Logistics, Stock level control, Data storage systems, Input-output devices, Economics, Personnel management, Systems engineering.

A preliminary system study was carried out at ASO (Aviation Supply Office) to determine the information needs of personnel and the actions requiring the use of the file for input/output. A study of equipment characteristics is in process and various equipment has been analyzed for suitability. Experimental equipment configurations are being considered as well as commercially available machines. Experiments in man-machine relationships cannot take place until suitable visual display equipment is available, but a research design has been formulated and experiments can begin as soon as the equipment is installed. A further study of the detailed information needs in a real-time environment is planned with further study in the Catalog, Stock Control and Technical sections of ASO. As visual display equipment is obtained for research purposes, the planned series of experiments will be conducted, gradually advancing to more advanced concepts involving changes to the computer executive program in order to provide information in a form which is more compatible with real-time operations. (Author)

AD-602 226 Div. 30, 15, 32
OTS Price $0.50

Moore School of Electrical Engineering, Univ. of Pennsylvania, Pa.
AUTOMATIC CLASSIFICATION FOR THE DDC MATHEMATICS COLLECTION; A STATISTICAL OPTIMIZATION OF SEARCH TIME IN AN INFORMATION RETRIEVAL SYSTEM; THE USE OF REAL TIME COMPUTERS FOR INVENTORY CONTROL.
Research progress rept.,
by P. L. Leifer, B. Zimmerman, and D. D. Sharp, Jr.
May 64, 3p MSEE 64 17, MSEE-64 21
Contract Nonr551 40

Unclassified report

Descriptors: (*Abstracts, Information retrieval), (*Documentation, Mathematics), (*Information retrieval, Search theory), (*Inventory control, Data processing systems), Real time, Computers, Subject indexing, Vocabulary, Computer storage devices, Mathematical models, Optimization.

This report consists of abstracts of the three reports.

AD-602 229 Div. 30
OTS Price $0.50

Mitre Corp., Bedford, Mass.
AN APPROACH TO COMPARING COSTS OF ELECTRONIC PROCESSING OF PERT DATA: PERT I VERSUS PERT III,
by A. E. Autio. Jun 64, 16p Mitre W-6611
Contract AF19 628 2390, Proj. 850
ESD TDR64 113

Unclassified report

Descriptors: (*Data processing systems, Digital computers), (*Programming (Computers), Costs), (*Compilers, Effectiveness), Systems engineering, Programming languages, Economics.

This document develops relationships for estimating costs of processing single runs of PERT data on the 7090 computer on the basis of the number of activities per network. A comparison is also made of the PERT I vs. PERT III processing costs in which the latter appears decidedly more attractive, particularly in the larger networks. (Author)

AD-602 230 Div. 30, 17
OTS Price $2.60

Rensselaer Polytechnic Inst., Troy, N. Y.
THE DESIGN AND CONSTRUCTION OF A HIGH TEMPERATURE LABORATORY.
Master's thesis,
by Nathan G. Tupper. Jun 64, 36p

Unclassified report

Descriptors: (*Creep, Test facilities), (*High-temperature research, Laboratories), (*Metallurgical laboratories, Design), Test equipment, Construction, Loading (Mechanics), Stresses, Strain (Mechanics), Recording Systems, Furnaces.

The work was concerned with the design and construction of a high-temperature laboratory for use in investigation of the first and second stages of creep. The modification of four lever-arm units is described, with emphasis on the reduction of tare load, the minimizing of bending stresses on the specimen, and the improvement of the strain-measuring system. The design and construction of six dead-weight units is described. A unique loading system consisting of a barrel roller bearing, universal joint, and chain is presented. An accurate, automatic system for measuring and recording strain is described. The selection of proper furnaces and controlling equipment is described. Wiring diagrams, drawings and schematic diagrams are presented where pertinent. (Author)

AD-602 241 Div. 30
OTS Price $2.25

Aerospace Corp. Los Angeles Calif.
PROFESSIONAL PAPERS CLEARED FOR POSSIBLE PUBLICATION AND/OR PRESENTATION.
Rept. for 16 Jun 63-15 Jun 64,
by Frances A. Brady. 30 Jun 64, 86p
CSR-269 9990APP1,supersedes CSR-269 9990PP1-PP11
Contract AF04 695 269

Unclassified report

Descriptors: (*Bibliographies, Scientific research), Reports, Physics, Chemistry, Mathematics, Engineering, Miningengineering, Aeronautics, Space flight, Metallurgy, Geology.

The bibliography is an integration of the previous bibliographies together with additions,and is comprised of a listing of all professional papers cleared at Aerospace Corporation for the period 16 June 1963 through 15 June 1964.

and may be critical or unevaluated; provisions must be made for handling all aspects of data. Methods for handling data range from manual to machine and information can be filed by material, property or by a random access method. The existing data systems provide examples of the various methods available for handling data. Although some existing systems handle plastics data the coverage is not complete and there still remains a need for a unified data center in plastics. A manual system consisting of data sheets filed by material is recommended for the present. This system can easily be converted for machine storage and retrieval if necessary. (Author)

AD-602 134 Div. 32, 26
OTS Price $10.10

Columbia Univ., New York. School of Engineering and Applied Science.
ON THE ORDER CYCLE SYSTEM OF INVENTORY CONTROL.
Technical rept. no. 21,
by Norman Agin. 15 Apr 64, 130p
Contract Nonr266 55

Unclassified report

Descriptors: (*Inventory control, Stock level control), (*Inventory analysis, Inventory control), Management engineering, Inventory, Costs, Mathematical models, Logistics, Operations research, Statistical analysis.

An inventory problem where an order for a variable amount of some commodity is placed at equally spaced intervals of time was considered. More specifically, every N periods an order is placed for an amount which brings the sum of stock-on-hand plus on-order up to some level S. The objective was to find values N* of N and S* of S which minimize steady state expected costs per unit time. The model treats a single item for which there is random demand. Demands in successive periods of unit time are independent with equal means and variances. The usual constraints such as aggregate or individual production requirements, maximum size of inventory, or the recognized obsolescence of the item in the near future were not considered. Further, demands that arrive when there is no positive inventory on-hand are backordered and satisfied, eventually, out of incoming orders. The case when these demands are lost, called the lost sales case, was not treated. (Author)

AD-602 165 Div. 32
OTS Price $4.00

Air Force Cambridge Research Labs., Bedford, Mass.
REPORT ON RESEARCH AT AFCRL. SURVEY OF PROGRAMS AND PROGRESS IN FY-1963.
Rept. for Jul 62-Jul 63.
Feb 64, 264p
AFCRL 64 25

Unclassified report

Descriptors: (*Air force research, Reports), Radio astronomy, Astrophysics, Antennas, Phonons, Magnetic fields, Chemical analysis, Meteorological satellites, Atmospheric motion, Aerospace craft, Data processing systems, Radiation effects, Plasma sheath, Ultraviolet radiation, Artificial intelligence, Geodesics, Geology, Crystal lattices, Balloons, Flight paths, Crystal growth, Infrared radiation.

Research activities for the year 1963 as performed at the Air Force Cambridge Research Laboratories in the physical, environmental, and mathematical sciences is summarized. Recent achievements, progress, and results of these scientific investigations are described.

32. MISCELLANEOUS ARTS AND SCIENCES

AD-601 701 Div. 32, 18
OTS Price $2.00

Army Natick Labs., Mass.
MILITARY TYPESETTING EQUIPMENT AND SYSTEMS FOR INDO-ARYAN AND DRAVIDIAN LANGUAGES (HINDI, MARATHI, BENGALI, PUNJABI, GUJARATI, MALAYALAM, TAMIL, AND TELUGU) (1961-1963).
Technical rept.
by Edward Nitenson. Feb 64, 79p

Unclassified report

Descriptors: (*Language, India), (*Typewriters, Language), Printing, Lithography, Military training.

This is the first known attempt to assemble technical, engineering, and Indian language data needed to develop military field typesetting equipment that will provide the United States Army an effective capability for preparing indoctrination material in the native language of India. During the initial phase of this study it was determined that eight Indo-Aryan and Dravidian languages are understood by the largest proportion of the literate population of India. Therefore, efforts were directed toward obtaining data applicable to field equipment for typesetting these languages. As a result, sufficient reliable information was compiled from knowledgeable national and international sources for conducting exploratory development and engineering programs for (a) improving and adapting commercially available Indian typewriter keyboards to military equipment and (b) developing new-concept typesetting equipment and systems that will fulfill immediate, future, and long-range Indoctrination Program requirements. (Author)

AD-601 706 Div. 32
OTS Price $1.25

David Taylor Model Basin, Washington, D. C.
STANDARDIZATION REQUIREMENTS FOR TECHNICAL REPORTS.
Revision no. 2
by Robert E. Lord. Mar 63, 44p
DTMB 1010, PB 144 372

Unclassified report

Descriptors: (*Reports, Standardization), (*Reports, Military requirements), Military publications, Scientific research, Standards.

The report presents the technical report standards established by the Bureau of Ships for its various laboratories and defines the different kinds of BuShips reports. It also outlines the procedures to be followed by the David Taylor Model Basin in the preparation and publication of technical reports consistent with BuShips policy. (Author)

AD-601 891 Div. 32, 26
OTS Price $5.60

Department of Justice, Washington, D. C.
REPORT OF THE ATTORNEY GENERAL, PURSUANT TO SECTION 2 OF THE JOINT RESOLUTION OF SEPTEMBER 6, 1963, CONSENTING TO AN INTERSTATE COMPACT TO CONSERVE OIL AND GAS.
Annual rept.
by Robert F. Kennedy. Jun 64, 60p

Unclassified report

Descriptors: (*Petroleum, Commerce), (*Industrial production, Petroleum industry), Costs, Economics, Effectiveness, Tables, United States government, Control, Reports.

Topics include: conservation and competition. (conservation activity, survey activities); Interstate Oil Compact Commission. (regular I. O. C. C. activity, Governors Study Committee); state action. (divergence of state production policies, re-emergence of Ohio); federal action. (background, statistical problems, government data responsibility); industry activity.

AD-601 900 Div. 32
OTS Price $0.50

RAND Corp., Santa Monica, Calif.
TRADE WITH COMMUNIST COUNTRIES, YES OR NO.
by Egen Neuberger. May 64, 16p P-2912

Unclassified report

Descriptors: (*Commerce, Communists), (*Political science, Communists), USSR, Foreign government, Foreign policy, Social sciences, Europe, Cuba, Cold war, China.

An analysis of the various issues underlying the complex interplay between the economic and political aspects of international economic relations in the present period of hot peace.

AD-602 066 Div. 32, 30
OTS Price $9.60

Thomas J. Watson Research Center, Yorktown Heights, N. Y.
AUTOMATIC LANGUAGE TRANSLATION.
Final rept.
Apr 64, 115p
Contract AF30 602 3145, Proj. 4599, Task 459901
RADC TDR64 64

Unclassified report

Descriptors: (*Machine translation, Language), (*Language, Machine translation), Dictionaries, Programming (Computers), Documentation.

This report summarizes research performed and describes the status of automatic language translation work at IBM as of Dec. 31, 1963. 86,545 entries were either added or deleted from the dictionary. The editing of the dictionary included the incorporation of microglossaries in 13 fields in the main body of the dictionary. As a result of a study, verb entries were classified on the basis of the government of cases. The bidirectional program embodies all major limited environment linkages. It is now ready to be expanded into a sentence-wide syntactic analysis. The multipass program, which is equivalent in its analytic capabilities to the bidirectional program of June 1963, is in the process of being debugged. It will be capable of handling random text. (Author)

AD-602 085 Div. 32, 14
OTS Price $1.25

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
AN EVALUATION OF DATA COLLECTIONS FOR PLASTICS.
by Gunther Cohn and Carol Carr. May 64, 50p I-B2104 1
Contract DA36 034 501AMC0119A

Unclassified report

Descriptors: (*Plastics, Documentation), (*Documentation, Plastics), (*Data storage systems, Plastics), Data processing systems, Information retrieval, Libraries.

Recommendations are made for a data system suitable for the Plastics Technical Evaluation Center on the basis of a study of various aspects of data and existing data systems. PLASTEC needs data to carry out its function as an information center and to answer requests. The data sources available include unpublished information, the report, and open literature in plastics. Data exists in tabular and graphic form

33. TRANSPORTATION

AD-601 853 Div. 33, 2, 5, 8
OTS Price $2.25

Radio Corp. of America, Burlington, Mass.
INVESTIGATION OF SOME ELECTRONIC AND MECHANICAL INTERFACE PROBLEMS IN THE AN/TSQ-47 SYSTEM,
by James J. Lauginiger, Charles V. Mahlmann, Emmett H. Reid, and Herbert W. Varley. Jan 64, 82p
Contract AF19 604 8020
ESD TDR64 199, ESD TDR63 601 S

Unclassified report

Descriptors: (*Air traffic control systems, Performance (Engineering), Radio communication systems, Radio receivers, Very high frequency, Radio frequency interference, Electromagnetic pulses, Pulse communication systems, Noise (Radio), Noise (Radar), Radar equipment, Ultrahigh frequency, Suppressors, Electromagnetic shielding, Shelters, Packaging, Containers, Air transportation, Barometers, Wind, Airports, Wind direction indicators, Meteorological instruments, Lighting equipment.

This report discusses certain electronic and mechanical interfaces associated with system integration and ground support of the AN/TSQ-47 air traffic control system. Problem areas are defined and suggestions are set forth for improvement and standardization. Discussions and recommendations for meteorological equipment and a mobile runway lighting system are included. (Author)

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NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

PB 166 047 Div. 2, 30, 31
OTS price $13.50

Lamont Geological Observatory, Palisades, N. Y.
U.S.N.S. ELTANIN CRUISES 4, 5 AND 6, JULY, 1962 TO JANUARY, 1963. BATHYTHERMOGRAPH DATA.
Technical rept. no. 2
by Saul Friedman. 1964, 193p, CU 264
Grant NSF GA27

Unclassified report

Descriptors: (*Bathythermograph data, Polar regions), (*Oceanographic vessels, Exploration), Hydrographic surveying, Oceans, Salinity, Surface temperatures, Recording systems, Scientific organizations, Oceanology.

In general bathythermograph observations, surface salinity samples and bucket surface water temperatures were taken hourly, when possible, between hydrographic stations in the Drake Passage and Bransfield Strait, with more frequent observations being run in the vicinity of the Antarctic Polar Front. A Hytech, Hydrotemp-Surface Temperature Recorder was run constantly and correlated with the bucket surface water temperatures. Upon completion of the cruises, the bathythermograph coated slides with their appropriately calibrated grids were enlarged on a projection table viewer. The slides were adjusted to the selected surface water temperature and an average depth correction for each group of slides was determined using the standard U.S. Naval Oceanographic Office procedure. Then, temperature in degrees Fahrenheit and depth in feet were picked off the enlarged projection and recorded. Points at which these temperatures and depths are listed were selected to show temperature inversions, maximum, minimum and deepest values.

PB-166 048 Div. 2, 30, 31
OTS price $6.60

Lamont Geological Observatory, Palisades, N. Y.
PHYSICAL OCEANOGRAPHIC DATA OBTAINED DURING ELTANIN CRUISES 4, 5 AND 6 IN THE DRAKE PASSAGE ALONG THE CHILEAN COAST AND IN THE BRANSFIELD STRAIT, JUNE 1962-JANUARY 1963.
Technical rept. no. 1,
by Saul B. Friedman. Mar 64, 64p CU 1 64
Grant NSF GA27

Unclassified report

Descriptors: (*Oceanographic data, Polar regions), (*Oceanographic vessels, Exploration), Hydrographic surveying, Oceans, Arctic regions, Salinity, Surface temperatures, Ocean currents, Oceanographic equipment, Thermometers, Salinometers, Oceanology.

The observational program consisted of north-south traverses spaced every 2-1/2 to 5 degrees of longitude apart. The traverses generally started at 55 degrees S latitude at the northern position and extended as far south as the Antarctic continental shelf or until thick ice prevented further southern penetration. The scientific objectives of the survey were to study the structure and flow of the water masses in this region, which is the boundary between the Atlantic and Pacific Oceans; this area, after Stommel (1958), forms the great question mark in the water budget of the depths in the whole world ocean.

4. CHEMISTRY

PB-166 044 Div. 4, 25
OTS price $1.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
PHOTO-IONIZATION CONTINUA. I. THE BOUND FREE CONTINUA OF NEGATIVE IONS.
Technical Information series
by R. G. Breene, Jr. Apr 64, 17p, R64SD28

Unclassified report

Descriptors: (*Photochemistry, Gas ionization), (*Oxygen, Ionization), Atomic orbitals, Field theory, Wave functions, Dipole moments, Polarization, Electrons, Operators (Mathematics), Numerical analysis, Matrix algebra.

The photo-ionization or bound free continuum of the negative oxygen ion is considered. The effects of correlation in the bound function and the form of the operator on a treatment of the phenomenon are directly demonstrated while the effect of polarization in the free function is pointed out. For the representations of the operator used the asymptotic form of the free function is essentially equivalent to the precise form. An ab initio calculation for the cross section yields results some thirty percent greater than experiment and of the proper form. (Author)

PB 181 695 Div. 4, 13
OTS price $2.00

American Cyanamid Co., Stamford, Conn.
BY-PRODUCTS FROM SALINE WATER CONVERSION PLANTS. A FEASIBILITY STUDY.
Research and Development progress rept.
by Arthur J. Weingerger and Darwin F. DeLapp. 1964,71p
Contract 14 01 0001 308,
OSW PR110

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Feasibility studies), (*Bromine, Production), (*Magnesium compounds, Oxides), (*Sodium compounds, Chlorides), Water supplies, Minerals, Chemicals, Separation, Costs, Recovery.

This report summarizes a feasibility study on recovery of by-products from saline water conversion plants conducted for the Office of Saline Water, United States Department of the Interior, by the American Cyanamid Company. The objective of the survey has been to determine whether recovery of salable by-products from minerals present in saline waters offers a practical route to reducing the overall cost of converting these saline feeds to fresh water, and to delineate areas for further research and development on recovery processes. The investigation was purposely made broad to include a maximum number of the known processes and chemical reactions which could be used - either singly or in combination - to recover minerals present in economically significant amounts. The choices were narrowed by comparing the value of bulk by-products with major cost elements using the particular process, and preliminary cost estimates were made for the most promising of the remainder. Only products isolated directly from saline water were included; further upgrading was not considered in this initial study, although it would probably improve the overall economics. (Author)

Descriptors: (*Antenna radiation patterns, Theory), *Gain, *Beams (Electromagnetic), Numerical methods and procedures.

The problem in relating the parameters used in calculating antenna gain and beamwidth is mainly associated with the chosen definition of beamwidth. A mathematical derivation of the constants relating antenna gain and beamwidth parameters for various values of defined beamwidth and aperture illumination patterns is included. The results are then presented in graphical form. (Author)

AD-423 392 Div. 8
OTS price $0.75

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
A REVIEW OF THE STATE-OF-THE-ART IN MILLIMETER TECHNOLOGY.
by A. H. Green, Jr. 18 Sep 63, 26p
Proj. 1B222901A204
AMC-RA RE TR63 30, N64 12367
Unclassified report

Descriptors: (*Millimeter waves, Microwave communication systems), (*Microwave communication systems, Millimeter waves), Waveguides, Attenuators, Dielectrics, Klystrons, Backward-wave oscillators, Harmonic oscillators, Semiconductors, Semiconductor devices, Tunnel diodes, Microwave equipment, Power dividers, Wave transmission, Antennas, Crystal detectors.

The purpose of this report is to relate the present state-of-the-art knowledge in millimeter wave technology with regard to three primary subjects: (1) Transmission Methods, (2) Power Sources, and (3) Signal Detection. This report discusses each subject in some detail. The major result is the conclusion that only transmission methods are at an advanced technical level, while power sources and signal detectors require further research and development. (Author)

AD-425 090 Div. 8, 14
OTS Price $2.50

Ion Physics Corp., Burlington, Mass.
RESEARCH LEADING TO SIGNIFICANT IMPROVEMENT OF ELECTRETS.
Technical documentary rept. 12 Nov 62-12 Sep 63,
by Herbert Gersch and Alexander Stewart. Nov 63, 103p
Contract AF33 657 10199, Proj. 8128, Task 812808
RTD TDR63 4121
Unclassified report

Descriptors: (*Electrets, Dielectric properties), Organic materials, Waxes, Polymers, Lipids, Ceramic materials, Glass, Air, Vacuum, Stability, Capacitors, Voltage, Polarization, Measurement, Dielectrics, Electrostatic generators, Density.

PB-181 699 Div. 8, 1
OTS price $0.50

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
GYROSCOPE TEST SET AN/ASM-117. PART NO. TG-62.
Instrument Calibration Procedure Manual
15 Mar 64, 14p
NAVWEPS 17 20QT01
Unclassified report

Descriptors: (*Gyroscopes, Test equipment (Electronics)), (*Test equipment (Electronics), Calibration), Measuring devices (Electrical and electronic), Voltmeters, Ammeters, Synchronization (Electronics).

This manual contains calibration instructions that will enable calibration personnel to determine whether the equipment is operating within the prescribed specification limitations. It also includes a list of calibration equipment, corrective action instructions, and instructions for the evaluation and recording of data. (Author)

9. FLUID MECHANICS

AD-421 702 Div. 9, 1
OTS price $2.00

Boeing Co., Seattle, Wash.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO COMPLEX AERODYNAMIC CONFIGURATIONS AT HYPERSONIC SPEEDS.
by George C. Lorenz, Robert J. Sartell, and Sainsbury L. Strack. Sep 63, 78p
Contract AF33 657 10033, Proj. 1366, Task 136607
ASD TDR63 530, N63 23132
Unclassified report

Descriptors: (*Aerodynamic heating, Model tests), (*Aerospace planes, Wind tunnel models), (*Wind tunnel models, Design), Aerodynamic configurations, Heat transfer, Test methods, Calibration, Airplane models, Canard configurations, Ceramic materials, Plants, Shock waves, Boundary layer, Angle of attack, Hypersonic flow.

Test with a heat sensitive paint and ceramic models representative of an Aerospaceplane were conducted. The purpose was to locate regions of severe heating and to obtain an approximation of the heat flux through the use of calibration spheres. The complex configurations produced some interesting and unexpected heating patterns. The magnitudes of the heat transfer coefficients on the models were found to be measurable by this method within ± 15%. It is concluded that this is an excellent technique for locating and measuring high fluxes, especially when used as a preliminary to conventional heat transfer and pressure testing procedures. (Author)

10. FUELS AND COMBUSTION

AD-284 238 Div. 10
OTS price $1.60

Princeton Univ., N. J.
RESEARCH ON SOLID PROPELLANT COMBUSTION INSTABILITY.
Final progress rept., 1 May 61-30 Apr 62,
by R. H. Woodward Waesche and Joseph Wenograd.
3 Aug 62, 11p AER564
Contract AF49 638 1073, ARPA Order24 61
Unclassified report

Descriptors: (*Combustion, Stability), (*Solid rocket propellants, Combustion), Oscillation, Acoustics, Temperature, Pressure, Velocity, Entropy, Test methods, Test equipment, Surface properties, Theory.

The accomplishments of a research program directed at the study of nonsteady combustion of a solid propellant with application to rocket instability are described. The experiments chosen are outlined. Some theoretical results of fundamental importance are summarized. Experiments made to this date are described. (Author)

AD-431 315 Div. 10, 27
OTS price $3.50

General Electric Co., Cincinnati, Ohio.
EFFECT OF HYDROCARBON FUELS ON THE OPERATION OF VAPOR PHASE FUEL SYSTEMS.
Rept. for Jun 62-Apr 63,
by G. G. Kutzko. Mar 64, 207p
Contract AF33 616 8224, Proj. 3048, Task 304801
ASD TDR62 920P2
Unclassified report

Descriptors: (*Fuel systems, Heat exchangers), (*Jet engine fuels, Vaporization), (*Fuels, Hydrocarbons), Alkanes, Kerosene, Terpenes, Naphthalenes, Polycyclic compounds, Combustion, Enthalpy, Heat transfer, Sprays, Combustion products, Heat sinks.

PB-181 696 Div. 4, 13
OTS price $2.75

General Atomic Div., General Dynamics Corp.,
San Diego, Calif.
REVERSE OSMOSIS FOR WATER DESALINATION.
Research and development progress rept.
by H. K. Longsdale, U. Merten, R. L. Riley, K. D. Vos,
and J. C. Westmoreland. 1964, 144p
Contract 14 01 0001 250
OSW PR111

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Osmosis), (*Osmosis, Desalination), (*Membranes, Osmosis) Fluid flow, Boundary layer, Cellulosic plastics, Cellulose acetates, Polyvinyl alcohol, Films, Electron microscopy, Transport properties, Permeability, Life expectancy, Economics, Costs, Mathematical analysis, Ions.

Topics include: Flow relationships in reverse osmosis; boundary-layer effects; electron microscope study of the structure of cellulose acetate membranes; transport properties of cellulose acetate membranes; polyvinyl alcohol membranes; transport properties of cellophane; other alternative membrane materials; lifetime properties of cellulose acetate; economic study.

PB-181 703 Div. 4, 13
OTS Price $2.75

Carrier Corp., Syracuse, N. Y.
DEVELOPMENT OF THE DIRECT FREEZE SEPARATION PROCESS.
Rept. for 17 Aug 62-17 May 63,
by Wilfred J. Hahn, Rodney C. Burns, Robert S. Fullerton,
and Dewey J. Sandell. Jun 64, 134p
Contract 14 01 0001 286
OSW PR113

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Refrigeration systems), Water supplies, Separation, Freezing, Structural parts, Control systems, Operation, Performance (Engineering), Economics, Costs, Feasibility studies.

The production capacity of the direct freeze separation column at Wrightsville Beach was significantly increased and the column structural design and control system was simplified. The practical range of plant capacities was evaluated. A feasible modular plant capacity was determined to be approximately 165,000 gal./day, although larger capacities are practical. Owning and operating costs were estimated in detail for the above plant capacity.

7. ELECTRICAL EQUIPMENT

AD-436 294 Div. 7, 14, 17, 26
OTS price $3.00

Westinghouse Electric Corp., Lima, Ohio.
ALKALI METAL RESISTANT WIRE.
Preliminary rept.
by E. S. Bober, R. E. Stapleton, and W. H. Snavely.
15 Apr 64, 163p
Contract AF33 657 10701, Proj. 8128, Task 812806
APL TDR64 42

Unclassified report

Descriptors: *Ceramic coatings, Electric wire, (*Electric wire, Corrosion inhibition), Alkali metals, Liquid metals, Environmental tests, Potassium, Vapors, High-temperature research, Silver, Nickel, Seals (stoppers) Cladding, Aluminum compounds, Nitrides, Magnesium compounds, Oxides, Stainless steel, Zirconates, Copper, Zirconium compounds, Vapor plating, Mercury, Radiation damage, Flame spraying, Soldering alloys, Resistance (electrical).

A ceramic coated conductor system was developed that was unaffected by 172 hours exposure to K (potassium) vapor at 850 C. This system was Metco 201 zirconia, plasma sprayed on nickel aluminide coated Nickel clad Silver AWG 8 (Sylvania) wire. This system, however, is not suitable for electrical operation at 850 C since the resistance of the zirconia coating drops to about 5 ohms at 600 C. Overcoating the zirconia with aluminum nitride by a vapor plating technique results in a resistance at 850 C in argon for the multicoat of 18000 ohms. The aluminum nitride overcoated zirconia is unaffected by 172 hours exposure. A number of high purity insulators were found to be resistant to potassium vapor at 850 C. These were alumina, magnesia, and strontium zirconate. Data obtained on lead in insulators of test capsules indicates a decrease in surface resistivity, however, the lowered resistance of these insulators is still in a useful range. Statorette adherence tests show several insulated conductors will withstand vibration, shock and acceleration conditions. (Author)

PB-166 062 Div. 7, 8
OTS price $10.10

General Electric Co., Syracuse, N. Y.
SOLID STATE FILTERS, DELAY LINES AND TRANSFORMERS.
Quarterly rept. no. 5, 1 Jul-1 Oct 60.
by A. Rosengreen, C. M. Stearns, and S. W. Tehon.
1 Oct 60, 121p
Contracts DA36 039sc78346 and BSR81369,
Proj. 3 26 00 700, Task 3 26 07 703
AD 248 729L

Unclassified report

This rept. includes Research and Development of Ceramic Power Transformers, Interim development rept. no. 1, 1 Jun-1 Oct 60, Contract BSR81369

Descriptors: (*Power transformers, Ceramic materials), (*Ceramic materials, Tests), (*Delay lines, Transducers (Acoustic)), *Radiofrequency filters, Broadband, Ferroelectric materials, Miniature electrical equipment, Resonators, Frequency, Voltage, Polarization, Transformers, Temperature, Ultrasonic radiation, Propagation, Transducers, Design.

Caramic high voltage transformer work was continued during this quarter. Measurements were made to determine how the caramic material parameters behave with both increasing drive voltage and increasing ambient temperature. The mechanical Q and maximum output frequency both decreased with increasing drive voltage and ambient temperature. The coupling coefficient, however, remained relatively constant with changes in ambient temperature and increases with increasing drive voltage. A new technique for longitudinally polarizing long samples of ferroelectric ceramic is described and initial results are discussed. A new technique for obtaining circular polarization in a ferroelectric ceramic tube is also described. The characteristics of some torsional filter elements produced by this technique are presented along with the results of some broad-banding studies with these elements. A basis discussion of the modes of ultrasonic propagation in a delay wire is included along with a brief discussion of the characteristics of each mode. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-283 121 Div. 8
OTS Price $3.60

Rome Air Development Center, Griffiss AFB, N. Y.
NUMERICAL CONSTANTS RELATING GAIN AND BEAMWIDTH TO ANTENNA PARAMETERS,
by Anthony F. Snyder. Jun 62, 32p
Proj. 4519, Task 451901
RADC TDR62 211, N62 15534

Unclassified report

PB-166 053 Div. 13, 9
OTS price $9.60

Illinois Univ., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART 2. TESTS OF REINFORCED CONCRETE DEEP BEAMS WITH WEB AND COMPRESSION REINFORCEMENT.
by J. R. Winemiller and W. J. Austin. Aug 60, 119p
Contract AF29 601 468, Proj. 1080
AFSWC TR59 72P2 AD 244 739

Unclassified report

Descriptors: (*Beams (Structural), Reinforced concrete), (*Reinforced concrete, Beams (Structural)), Structural properties, Tensile properties, Compressive properties, Loading (Mechanics), Test equipment, Test methods, Tests, Experimental data, Graphics, Structural parts, Design.

The results of tests of seven reinforced concrete deep beams with tensile and web reinforcement and two beams with tensile and compressive reinforcement are described in this report. Several patterns of web reinforcement were used. The beams with web reinforcement had a span-depth ratio of about 3.0 and the beams with compressive reinforcement had a span-depth ratio of 2.32. All beams were tested under uniform, slowly-applied loading. The general behavior of the test specimens is described and explanations of the observed phenomena are given. (Author)

PB-166 054 Div. 13, 9
OTS price $10.50

Illinois Univ., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART 3. TESTS OF REINFORCED CONCRETE DEEP BEAMS.
by H. A. R. dePaiva and W. J. Austin. Mar 60, 137p
Contract AF29 601 468, Proj. 1080
AFSWC TR59 72P3 AD 240 853

Unclassified report

Descriptors: (*Beams (Structural, Reinforced concrete), (*Reinforced concrete, Beams (Structural)), Structural properties, Mechanical properties, Loading (Mechanics), Stresses, Strain (Mechanics), Deflection, Failure (Mechanics), Test equipment, Test methods, Tests, Experimental data, Graphics, Structural parts, Design.

Tests of eleven reinforced concrete deep beams subjected to slowly applied, uniform loading are described in this report. Studies of the strength and behavior of simply supported, reinforced concrete deep beams are made, and procedures for the prediction of the static load-deflection behavior of such members up to flexural failure are presented. (Author)

PB-166 055 Div. 13, 9
OTS price $9.60

Illinois Univ., Urbana.
BEHAVIOR AND DESIGN OR DEEP STRUCTURAL MEMBERS. PART 4. DYNAMIC TESTS OF REINFORCED CONCRETE DEEP BEAMS.
by R. E. Untrauer. May 60, 114p
Contract AF29 601 468, Proj. 1080
AFSWC TR59 72P4 AD 247 468

Unclassified report

Descriptors: (*Beams (Structural), Reinforced concrete), (*Reinforced concrete, Beams (Structural), Mechanical properties, Reinforcing materials, Stresses, Strain (Mechanics), Deflection, Test methods, Dynamics, Statics, Test equipment, Tests, Experimental data, Graphics, Structural parts, Design, Loading (Mechanics).

Tests of simply supported reinforced concrete deep beams subjected to rapidly applied loads are described in this report. Five beams were tested under a triangular-shaped pulse and three beams were tested under a flat-top pulse of 'infinite duration'. Five beams were tested statically to serve as control beams for the beams tested dynamically. Studies of the relationships of the sum of the measured reactions to deflections, steel strains and concrete strains are made. Data concerning the effect of strain rate on the behavior are presented. (Author)

PB-166 056 Div. 13, 9
OTS price $13.00

Illinois Univ., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART 5. RESISTANCE AND BEHAVIOR OF REINFORCED CONCRETE BEAMS OF NORMAL PROPORTIONS UNDER RAPID LOADING.
by A. Feldman. Mar 60, 184p
Contract AF29 601 468, Proj. 1080
AFSWC TR59 72P5 AD 240 854

Unclassified report

Descriptors: (*Beams (Structural), Reinforced concrete), (*Reinforced concrete, Beams (Structural)), Mechanical properties, Failure (Mechanics), Stresses, Strain (Mechanics), Deflection, Test methods, Loading (Mechanics), Dynamics, Statics, Test equipment, Tests, Experimental data, Graphics, Structural parts, Design.

The immediate objective of the work at hand was the determination of the resistance and behavior of simple-span reinforced concrete beams subjected to impulsive loading. To accomplish this objective, tests of beams have been made and the resulting data analyzed. It was also the purpose of this work to check the practicability of an existing method of computing the resistance of dynamically loaded reinforced concrete beams. To this end, comparisons have been made between the test results and the predictions of the method of analysis. (Author)

PB-166 057 Div. 13, 9
OTS price $9.10

Illinois Univ., Urbana.
BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS. PART 6. THE YIELD STRENGTH OF INTERMEDIATE GRADE REINFORCING BARS UNDER RAPID LOADING.
by W. A. Keenan and A. Feldman. Mar 60, 107p
Contract AF29 601 468, Proj. 1080
AFSWC TR59 72P6, AD 240 855

Unclassified report

Descriptors: (*Beams, Structural, Steel), (*Steel, Reinforcing materials), Mechanical properties, Deformation, Stresses, Strain (Mechanics), Test methods, Loading (Mechanics), Dynamics, Statics, Test equipment, Tests, Experimental data, Graphics, Structural parts, Design.

The object of this investigation was to determine the influence of rapid loading on the yield strength of deformed reinforcing bars of intermediate grade steel. Thirty-four specimens consisting of 2-foot coupons cut from No. 6, No. 7, and No. 9 bars were tested at room temperature under uniaxial tension. The static yield strengths ranged between 40,500 psi and 48,900 psi. The dynamic yield strength varied from 102 to 149 percent of the static yield strength and was related to the strain rate during yielding. Load and strain data for each bar tested is presented in graphical and tabular form. (Author)

PB-181 694 Div. 13, 4, 7, 20
OTS price $2.75

Burns and Roe, Inc., New York.
PARAMETRIC COST STUDIES PERTAINING TO DUAL-PURPOSE POWER AND WATER DESALINATION PLANTS.
Research and development progress rept.,
by L. Stone, F. J. Patti, M. E. Knebel, W. G. Gerber, and M. Zizza. 1964, 145p
Contract 14 01 0001 345
OSW PR109

Unclassified report

Ten hydrocarbon fuels have been evaluated in a vaporizing heat exchanger to fuel exit temperatures up to 1300F in order to determine the feasibility of vaporizing fuels prior to combustion as a means of achieving increased heat absorbing capacity of fuels and determining the relationship between fuel properties and performance of a vaporizing system. The heat sinks obtained by use of these fuels rate approximately (in decreasing heat sink order) mixed normal paraffins, a special JP-6, hydrindan, Soltrol 170, HTF-35, SO2 treated naphthenic kerosene, decalin, pinane and clay treated furfural extract of light cycle gas oil. JP-4 (referee), a clay treated furfural extract of light cycle gas oil and pinane plugged the heat exchanger apparatus and are considered unsatisfactory for use as vaporizing fuels. The highest rates of heat transfer were found to be grouped in decreasing order as (JP-6, Soltrol 170, decalin and mixed normal paraffins), (HTF-35 SO2 treated naphthenic kerosene), hydrindan, (pinane, furfural extract of light cycle gas oil), and JP-4. (Author)

AD-437 979 Div. 10, 4
OTS Price $2.25

Aerojet-General Corp., Azusa, Calif.
RESEARCH ON NEW TECHNIQUES FOR ANALYSIS OF CONTAMINANTS IN LIQUID PROPELLANTS.
Final rept., 5 Mar 62-Mar 64,
by R. M. Roberts and J. R. Finkel. Mar 64, 98p
AGC 2638
Contract AF33 657 7936, Proj. 8169, Task 816902
APL TDR64 3

Unclassified report

Descriptors: (*Liquid rocket propellants, Contamination), Chromatographic analysis, Stability, Corrosion inhibition, Pentaboranes, Hydrogen peroxide, Hydrazine, Dimethyl hydrazine (1-1), Nitrogen compounds, Fluorides, Amines, Ammonia, Test equipment, Test methods, Impurities, Monitors, Storage, Tetroxides, Launching sites.

This program was a several-phased effort aimed at improving the state of the art of propellant-contamination surveillance. Detectable contaminants in 12 different storable propellants were characterized, and coherent gas-chromatograph methods were developed for their analysis. The end item, an automatic gas chromatograph for launch-site employment, was then designed and fabricated to incorporate this developed methodology. (Author)

PB-166 060 Div. 10, 4
OTS Price $2.60

Air Force Flight Test Center, Edwards AFB, Calif.
INFRARED ANALYSIS OF HYDROCARBON CONTAMINANTS IN LIQUID OXYGEN, GASEOUS HELIUM AND NITROGEN,
by Warren D. Reynolds, Wayne S. Solomon, and Wallace S. Anderson. Nov 58, 26p
AFFTC TN58 25, AD 203 781

Unclassified report

Descriptors: (*Liquid rocket propellants, Contamination), (*Oxygen, Liquefied gases), (*Helium, Contamination), (*Nitrogen, Contamination), Impurities, Hydrocarbons, Infrared spectroscopy, Rocket propellants, Storage.

Liquid oxygen, gaseous helium and nitrogen used in liquid-propelled ballistic missiles must meet both Federal specifications before acceptance and operational specifications before use. Among the specifications is that of hydrocarbon content. A rapid quantitative method was required to monitor the hydrocarbon content of liquid oxygen from the local oxygen plant production and that in the bulk handling and storage complex of the missile systems. Sampling procedure and equipment were devised to collect samples from pressurized liquid oxygen vessels and from gaseous helium and nitrogen missile systems. A gas manifold was constructed to facilitate the transfer, prepare standards and conduct analysis of these gases by infrared spectrophotometry. Standard curves were prepared to correlate log I/I sub o with concentration using the base-line technique. Results of ten analyses are included. (Author)

12. GUIDED MISSILES

PB 166 043 Div. 12
OTS price $10.10

Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRUCTURAL SHELL OPTIMIZATION STUDIES. VOLUME I: SURVEY OF BUCKLING DATA FOR MONOCOQUE CIRCULAR CYLINDRICAL SHELLS SUBJECTED TO UNIFORM EXTERNAL PRESSURE.
Final rept.
by E. V. Pittner. 30 Jun 61, 122p, LMSC 3 42 61 2
Contract NOrd18780

Unclassified report

Descriptors: (*Structural shells, Buckling (Mechanics), (*Buckling (Mechanics), Cylindrical bodies), (*Cylindrical bodies, Structural shells), (*Guided missile components, Buckling (Mechanics), Mathematical analysis, Stresses, Structures, Numerical analysis, Loading (Mechanics), Compressive properties, Theory, Experimental data, Hydrostatic pressure, Spacecraft.

A broad survey is made of the available theoretical and experimental investigations of buckling of thin-walled monocoque circular cylindrical shells subjected to uniform external pressure. A simple, approximate method of analysis for the buckling of such a shell is offered for the purpose of stress analysis. The loading with hydrostatic external pressure is considered as a special case of the interaction relation, and the method of analysis for this case is based on an approximate interaction relation derived from earlier theory. Available test data are presented in tabular form. Diagrams are included in which properly selected test data are evaluated. A diagramatic comparison of the suggested method of analysis and the test data shows a reasonably close agreement. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-419 631 Div. 13, 18, 20, 22
OTS price $10.10

Air Force Weapons Lab., Kirtland AFB, N. Mex.
PROJECT 1080 RESEARCH SUMMARY.
Summary rept., Jul 51-Feb 64
comp. by Douglas H. Merkle. Aug 63, rev. Feb 64, 130p
Proj. 1080
RTD TDR63 3023, N63 22126

Unclassified report

Descriptors: (*Nuclear explosion damage, Bibliographies), (*Structures, Nuclear explosion damage), Cratering, Deformation, Shock tubes, Underwater explosions, Wind tunnels, Air force research.

The report contains summaries of all research reports dealing with nuclear weapons effects on hardened structures. Section I contains edited abstracts of unnumbered reports, technical memoranda, technical notes, technical reports, and technical documentary reports. Section II lists all reports by document number (unnumbered reports are listed chronologically); Section III lists reports by subject area; and Section IV lists reports by contractor. (Author)

investigated were additional reinforcement materials, including stainless steel, nylon, and Fortisan, Mechanical properties data included tensile, compressive and flexural strength, and modulus of elasticity, as well as bearing strength and tensile fatigue values. Test temperatures used were room temperature, -110F, -320F, and -423F. Results of this program show several glass reinforced plastic laminate materials to be most promising as structural materials for use in cryogenic environments. (Author)

22. ORDNANCE

AD-433 567 Div. 22, 2, 30
OTS price $1.75

Naval Ordnance Lab., White Oak, Md.
HASP, INSTRUMENTED, RELEASE TO PROTOTYPE PRODUCTION FOR EVALUATION OF THE HEADS, 1.625-INCH, ROCKET, MK 1 MOD O AND MK 2 MOD O.
by M. J. Parker. 13 Jan 64, 69p
NOL TR63 272

Unclassified report

Descriptors: (*Sounding rockets, Instrumentation), Rocket heads, Rocket motors, Rocket-assisted projectiles, Meteorological instruments, Launching, Radiosondes, Measurement, Atmospheric temperature, Wind, Specifications, Production, Tests, Performance (Engineering).

This report contains, with the exception of drawings and specifications, the supporting technical documentation which substantiated the release to prototype production of the instrumented High Altitude Sounding Projectile (HASP) for determining atmospheric temperature and wind velocity up to 150,000-foot altitude. The Mk 32 Mod O rocket motor was the propulsion unit. Launching was from the 5 in /38 gun or the LOKI tube launcher. (Author)

25. PHYSICS

AD-430 915 Div. 25, 15
OTS Price $3.00

Naval Ordnance Lab., White Oak, Md.
MATHEMATICAL RELATIONS AND NUMERICAL TABLES FOR THE GEOMETRICAL ASPECTS OF DIFFUSION PROPAGATION IN ENCLOSED CHAMBERS,
by H. Gerber. 18 Dec 63, 195p
NOL TR63 139

Unclassified report

Descriptors: (*Correlation techniques, Thermodynamics), (*Diffusion, Propagation), Pressure vessels, Gases, Temperature, Heat transfer, Dynamics, Low frequency, Volume, Pressure, Equations, Numerical analysis, Data, Tables.

This report presents relations for determining the time-varying, average temperature which results from the diffusion of heat to the walls of a gas-filled enclosure. At infrasonic frequencies, the average temperature is the basic quantity that determines the relationship between dynamic volume and pressure changes. Sinusoidal and step changes are emphasized, and extensive, five-figure, tabulated data are given for the sphere, the infinite narrow box, and a wide range of finite cylinders. (Author)

AD-431 568 Div. 25
OTS Price $5.00

Naval Ordnance Lab., White Oak, Md.
TRANSIENT AND SINUSOIDAL THERMAL DIFFUSION, CONVECTION, AND RELATED INFRASONIC PRESSURE CHANGES IN ENCLOSED FLUIDS,
by H. Gerber. 1 Oct 63, 376p
NOL TR62 94 N64 18360

Unclassified report

Descriptors: (*Thermodynamics, Diffusion), (*Diffusion, Thermodynamics), (*Thermal diffusion, Fluids), Pressure vessels, Pressure, Oscillation, Convection, Transients, Heat transfer, Gases, Low frequency, Acoustics, Temperature, Correlation techniques, Equations, Numerical analysis, Instrumentation.

This report presents analytical methods for calculating the precise magnitude of small pressure changes at infrasonic frequencies in enclosed fluids. Calculated results are tabulated and supplemented by experimental data. The information which is presented can be used for the rapid design of infrasonic instrumentation by mathematical methods. (Author)

AD-436 350 Div. 25, 17
OTS price $0.75

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
CONDENSATION HEAT TRANSFER. PART III: THEORY OF LIQUID METAL CONDENSATION.
Rept. for Apr-Nov 63
by Jon Lee. Mar 64, 26p Proj. 7340, Task 734008
ASD TDR62 1048, P3

Unclassified report

Descriptors: (*Liquid metals, Condensation), (*Heat transfer, Liquid metals), Model theory, Kinetic theory, Transport properties, Reynold's number, Turbulent boundary layer, Laminar boundary layer, Gas flow, Vapors,

Turbulent film condensation for liquid metals was investigated using both Nusselt's model and the two-phase model. The effect of turbulent transport was expressed by the eddy kinematic viscosities of Deissler and von Karman. The predictions of the average heat transfer coefficient are higher than the liquid metal data of Misra and Bonilla. However, under the premise that there is an upward vapor flow, we show qualitatively that an upward vapor flow can greatly reduce the heat transfer coefficient. The observed scatter of data may be attributable to the variations of vapor velocity.

27. PROPULSION SYSTEMS

AD-425 396 Div. 27, 12
OTS price $2.75

Lear Siegler, Inc., Grand Rapids, Mich.
PROPULSION SYSTEM MEASUREMENT AND CONTROL-DISPLAY INVESTIGATION FOR THE WHOLE PANEL CONCEPT. VOLUME I. PARAMETRICS AND DISPLAY INVESTIGATIONS.
Nov 63, 148p LSI GR-1435-I
Contract AF33 657 8739, Proj. 6190, Task 619005
RTD TDR63-4040 v1

Unclassified report

Report on Analytical Investigation of Data Requirements for Monitoring and Control of Rocket Engine Systems and Integration of the Requirements into the Control Display Concept.

Descriptors: (*Rocket propulsion, Control panels), (*Display systems, Rocket motors (liquid propellant)), (*Monitors, Rocket motors (liquid propellant), Liquid rocket propellants, Booster motors, Attitude control systems, Manned spacecraft, Measuring devices (Electrical and Electronic), Transducers, Communication equipment, Communication systems, Adaptive control systems, Rendezvous trajectories, Vernier rocket motors, Malfunctions, Launch vehicles (aerospace), Performance (engineering), Telemeter systems, Second stage motors, Space flight, Orbital trajectories.

Descriptors: (*Sea water, Desalination), (*Desalination, Costs), (*Electric power production, Nuclear power plants), (*Nuclear power plants, Feasibility studies), Water supplies, Evaporators, Power reactors, Reactor feasibility studies, Optimization, Turbines, Fuels, Steam power plants, Design, Performance (Engineering), Simulation.

Water and power production costs were determined, for multistage flash saline water conversion plants with from 7,000,000 to 50,000,000 gal./day capacity, in conjunction with electric power generators driven by steam from nuclear reactors of 40-, 70-, 120-, and 500- megawatt thermal power levels. Determination was also made of the minimum cost of production of potable water from sea water in a similar conversion plant, without by-product power production, using a 40-MWt nuclear reactor and, alternatively, a fossil fuel energy source.

PB-181 697 Div. 13
OTS price $1.00

Battelle Memorial Inst., Columbus, Ohio.
DESIGN OF A BASIN-TYPE SOLAR STILL.
Research and development rept.
by J. W. Bloemer, J.R. Irwin, and J. A. Eibling. Jun 64, 33p
Contracts 14 01 001 108 and 14 01 0001 284
OSW PR112

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Distilling plants), (*Distilling plants, Design), Water supplies, Production, Solar radiation, Energy conversion, Construction, Operation, Maintenance.

This report describes the design, construction, operation, and maintenance of a particular solar still that has been shown to be practical for converting saline water to fresh water at low cost in localities where there is a reasonable amount of sunshine. A series of photographs is included which illustrate the steps in constructing a still. (Author)

PB-181 700 Div. 13, 23, 31
OTS price $0.75

Office of Technical Service, Dept. of Commerce, Washington, D. C.
BUREAU OF SHIPS SHOP PRACTICE SUGGESTIONS.
May 64, 32p

Unclassified report

Descriptors: (*Machine shop practice, Shipyards), (*Naval shore establishments, Shipyards), Maintenance, Maintenance equipment, Maintenance personnel, Machine tools, Industrial equipment, Reviews.

14. MATERIALS (NON-METALLIC)

AD-425 551 Div. 14, 13
OTS price $5.60

Minnesota Univ., Minneapolis.
CREEP-FATIGUE INTERACTING UNDER CYCLIC LOADING CONDITIONS.
Rept. for Jan-Apr 63
by B. J. Lazan. May 63, 53p
Contract AF33 657 7453, Proj. 7351, Task 735106
ASD TDR63 644, N64 14468

Unclassified report

Descriptors: (*Materials, Mechanical properties), Load distribution, Loading (Mechanics), Stresses, Creep, Rupture, Fatigue (Mechanics), Microstructure, Environmental tests.

The limitations imposed by synergistic or interaction phenomena on the validity of linear superposition and summation approaches are discussed. In particular, single-variable data are shown to be generally inadequate for predicting mechanical properties under combined loads and environments. The immensity of a testing program required to investigate all important combinations of load and environment is illustrated and the significant reductions possible if synergisms are known is demonstrated. The operative micromechanisms and synergisms under combined static and fatigue loading are discussed, with particular reference to microstructural changes of mechanical and chemical origin. Analytical methods for predicting creep and rupture under variable stress from static creep data are reviewed and compared with experimental results. (Author)

AD-436 109 Div. 14, 8, 25
OTS price $2.25

National Cash Register Co., Dayton, Ohio.
RESEARCH AND INVESTIGATION OF CATHODOLUMINESCENT PHOSPHOR FILMS PREPARED BY SOLUTION SPRAYING.
Summary rept., 1 Jun 62-31 Aug 63,
by M. S. Hall. J. W. Gilliland, Jr., and E. Reinmuller.
Mar 64, 82p
Contract AF33 657 8985, Proj. 4156, Task 415605
AL TDR64 15 N64 19102

Unclassified report

Descriptors: (*Phosphorescent materials, Films), (*Cathode ray tube screens, Coatings), Sprays, Zinc compounds, Cadmium compounds, Tungstates, Sulfides, Silicates, Samarium, Cerium, Silver, Manganese, Impurities, X-ray diffraction analysis, Brightness, Luminescence, Emissivity, Crystal structure, Ultraviolet radiation, Electron bombardment.

The objective of the project was to determine the capabilities and necessary compromises in preparing cathodoluminescent films by a chemical solution spray process. This spray process is capable of forming cathodoluminescent films in situ on substrates which can withstand a spray temperature of 300C and a heat treatment temperature of 600C. Desired dopants may be incorporated by adding them to the spray solution. The cathodoluminescent film compositions investigated were: $CdWO_4$, $CdWO_4$:Sm, $CdWO_4$:Ce, $ZnWO_4$, Zn_2SiO_4:Mn, CdS:Ag, ZnS:Ag, and ZnCdS:Ag. Properties of these films were evaluated by x-ray diffraction analysis, by photo- and cathodoluminescent brightness and spectral emission, and by thermoluminescent glow-curve studies. (Author)

AD-436 873 Div. 14
OTS Price $2.25

Narmco Industries, Inc., San Diego, Calif.
DETERMINATION OF THE PERFORMANCE OF PLASTIC LAMINATES AT CRYOGENIC TEMPERATURES.
Rept. for 15 Nov 62-15 Feb 64,
by Don W. Chamberlain, B. R. Lloyd, and R. L. Tennent.
Mar 64, 96p
Contract AF33 616 8289, Proj. 7381, Task 738103
ASD TDR62 794P2

Unclassified report

Descriptors: (*Laminated plastics, Low-temperature research), (*Cryogenics, Laminated plastics), Epoxy plastics, Polyester plastics, Silicone plastics, Halocarbon plastics, Isocyanate plastics, Reinforcing materials, Glass textiles, Stainless steel, Tensile properties, Compressive properties, Elasticity, Fatigue (Mechanics), Performance (Engineering).

The program is a continuation of an effort to determine the mechanical properties of various plastic laminate materials at cryogenic temperatures. The program was extended to include additional resin systems, some of which have been developed specifically for cryogenic applications. Also

AD-426 307 Div. 30
OTS Price $8.60

Battelle Memorial Inst., Columbus, Ohio.
PROGRAMMING LANGUAGE FOR AUTOMATIC CHECKOUT EQUIPMENT. VOLUME I. ADAPTED PLACE FOR THE RCA DEE.
Rept. for 1 Jan-31 Dec 63,
by Burton H. Went. Oct 63, 95p
Contract AF33 657 9157, Proj. 8119, Task 811926
RTD TDR63 4171 V. 1

Unclassified report

Descriptors: (*Programming languages, Checkout equipment), (*Checkout equipment, Programming languages), (*Compilers, Control sequences), Programming (Computers), Computer logic, Digital computers, Algebras, Punched tape, Punched cards.

This report describes PLACE, a language for the programming of automatic checkout equipment, and tells how it can be used to write programs for the RCA DEE, an automatic checkout machine controlled by a digital computer. The language is such that any program can be written for the DEE without resorting to the use of actual machine language. The stimulus and measurement equipment of the DEE can be programmed at the machine language level through the use of special statements involving mnemonic symbols and numeric values. The controlling computer can be programmed by the use of algebraic language statements, similar to those found in FORTRAN and ALGOL, or at the machine language level by using special statements available for that purpose. In addition to the checkout-machine-controllong language, the programmer is provided with language to control the compiler. With this language he can define new statements which may be in a PLACE determined format, or as English language-like as he wishes to make them. The compiler-control language has facilities for writing arithmetic and Boolean expressions; logic decision tables; and compile-time subroutines, called forms, which may be called recursively. (Author)

AD-426 308 Div. 30
OTS price $8.10

Battelle Memorial Inst., Columbus, Ohio.
PROGRAMMING LANGUAGE FOR AUTOMATIC CHECKOUT EQUIPMENT. VOLUME II: ADAPTED PLACE FOR THE BENDIX AN/GJQ-9.
Rept. for 1 Jan-31 Dec 63
by Burton H. Went. Oct 63, 82p
Contract AF33 657 9157, Proj, 8119, Task 811926
RTD TDR63 4171V2

Unclassified report

Descriptors: (*Programming languages, Checkout equipment), (*Checkout equipment, Programming languages), (*Compilers, Control sequences), Programming (Computers), Computer logic, Digital computers, Algebras, Punched tape, Punched cards.

This report describes PLACE, a language for the programming of automatic checkout equipment, and tells how it can be used to write programs for the Bendix AN/GJQ-9, an automatic checkout machine controlled by a punched tape. The language is such that any program can be written for the AN/GJQ-9 without resorting to the use of actual machine language. Programming at the machine language level is done through the use of special statements involving mnemonic symbols and numeric values. In addition to the checkout-machine-controlling language, the programmer is provided with language to control the compiler. With this language he can define new statements which may be in a PLACE determined format, or as English language-like as he wishes to make them. The compiler-control language has facilities for writing arithmetic and Boolean expressions; logic decision tables; and compile-time subroutines, called forms, which may be called recursively. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

PB-166 061 Div. 32
OTS Price $1.60

Case Inst. of Tech., Cleveland, Ohio.
ESTIMATING AND COMPARING PUBLICATION COSTS OF SCIENTIFIC JOURNALS.
20 Feb 63, 17p
Grant NSF G16453

Unclassified report

Descriptors: (*Documentation, Periodicals), (*Periodicals, Costs), Operations research, Reports, Production, Economics, Analysis.

A method is presented which can be used both for evaluating the publication costs of scientific journals which are currently being published and for estimating the cost of proposed new journals. The data on which the cost equations were developed cover seventy-four scientific journals of widely different characteristics. They included journals of mathematics, physics, chemistry, biology, medicine, psychology, economics, and linguistics. Some of these were journals of abstracts. Most of the data came from one publisher and, hence, they do not provide adequate information on variations among different publishers or printers. Costs are divided into two classes, each of which is estimated separately, and then added to obtain an estimate of total cost. These classes of costs are circulation-dependent costs, and circulation-independent costs.

AD-416 733 Div. 32
OTS price $8.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
GUIDE FOR TECHNICAL REPORT PREPARATION.
by E. Spencer. 1 Jan 63, 84p
NADC-EL 6300

Unclassified report

Supersedes Rept. no. NADC EL5800 of 1 May 58.

Descriptors: (*Reports, Preparation), (*Scientific research, Documentation), Classification, Specifications, Military requirements.

The guide defines a technical publication; describes publication preparation processes; suggests a step-by-step procedure for writing publication manuscripts; describes the various types of Center publications; and provides a detailed breakdown of the suggested formats for letter reports and formal reports. The guide does not detail the basic principles of English grammar and composition. However, as a composition aid, a glossary of correct and approved usage of words commonly misused is added. (Author)

AD-422 417 Div. 32, 12, 14, 22, 31
OTS price $0.75

Defense Documentation Center, Alexandria, Va.
O-RINGS. A REPORT BIBLIOGRAPHY.
Rept. for Mar 53-Feb 63
comp. by Thomas C. Goodwin. Nov 63, reprinted Jan 64.
29p

Unclassified report

An analysis of liquid rocket propulsion systems was undertaken to determine the essential parameters related to this subsystem which must be sensed, displayed, recorded, or telemetered for adequate display and control during advanced aerospacecraft earth-orbital missions. A system capable of orbiting an integrated four-man crew station was selected for analysis. Investigation included engine performance monitoring, malfunction detection, and compensational control during missions involving advanced orbital plane-change maneuvers, rendezvous, and docking with other spacecraft. Based on this analysis, determinations were made of the probability and consequences of individual malfunction occurrences. Parameters were specified for recording, telemetering, and display, and a control-display panel and console were designed to fulfill the resulting control-display requirements. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

PB-166 040 Div. 28
OTS Price $4.60

Human Resources Research Inst., Maxwell AFB, Ala.
THE PREDICTION AND PERFORMANCE AT ADVANCED STAGES OF TRAINING ON A COMPLEX PSYCHOMOTOR TASK.
Research bulletin,
by Jack A. Adams. Dec 53, 47p
Proj. 509 020 0003,
HRRI RB53 49, AD 22 724

Unclassified report

Descriptors: (*Psychomotor tests, Performance (Human), (*Performance (Human), Psychomotor tests), *Psychometrics, Performance tests, Human engineering, Learning, Measurement, Tests, Training, Air force personnel, Reliability, Military training.

A study was conducted to determine classes of measures that best predicted performance at advanced stages of training on a complex psychomotor criterion task, the complex coordination test CM701E. The independent variables included printed test scores, scores from briefly administered simple psychomotor tests, and performance measures obtained during early and late stages in training on complex psychomotor tests. Measures from the final stages of complex psychomotor training were better predictors of final performance than were measures of the initial perfromance on the criterion task. (DDC abstract)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-289 862 Div. 30
OTS Price $4.60

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION.
Quarterly progress rept. no. 9, 1 Jun-31 Aug 62,
by A. E. Brain, J. W. Machanik, and G. E. Forsen.
Sep 62, 45p
Contract DA36 039sc78343, Proj. DA3A99 22 001 02,
Proj. SRI3192

Unclassified report

Descriptors: (*Data processing systems, Graphics), *Pattern recognition, Simulation, Data storage systems, Training devices, Training machines, Computer logic, Sampling, Digital computers, Electron optics, Integrators (Computers), Measurement, Input-output devices, Photoconductivity, Gate (Circuits), Programming (Computers), Performance (Engineering), Ferrites, Design.

Three important practical problems of learning machines are discussed: (1) Computer simulation of the proposed large scale machines, and the numerical data from which competitive designs may be evaluated; (2) The design of masks for sampling the retina. Three widely different approaches are treated, one of which could provide invariance with respect to translation and size variation; and (3) The fabrication of an m x n array of weights and gates, and the logic underlying the increment-decrement mechanism essential for its practical application. (Author)

AD-407 161 Div. 30, 6
OTS price $3.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
HIGH-PRECISION PRESSURE SENSOR.
Quarterly progress rept. no. 10, 8 Feb-7 May 63,
by Denis Cogswell, William H. Crabtree, Gerald Gottlieb, Edward J. McKay, Jr., and Gerald E. Pollon. May 63, 36p
ESL QR174, DSR8684
Contract NOw61 0400

Unclassified report

Descriptors: (*Pressure gages, Sound transmission), (*Sound transmission, Pressure gages), (*Pressure, Measurement), Hydrostatic pressure, Velocity, Sound signals, Liquids, Temperature, Transducers, Acoustic properties, Trigger circuits, Tunnel diodes, Stability, Waveguides, Pulse amplifiers, Transistors, Transistor amplifiers, Circuits, Dectectors, Models (Simulation), Instrumentation.

Research was continued toward development of a zero to 2500 psi pressure sensor having an overall precision of 1/4 psi. Primary effort was devoted to research on a laboratory model of equipment having the specified precision and based on sensing pressure through the velocity of sound in water. Current configurations of the laboratory model sound path and electronics are described. Stability run results indicating less than 0.1 psi peak to peak variation in output readings over a five-hour period at atmospheric pressure are presented and interpreted as demonstrating the feasibility of high precision pressure sensing through velocity of sound techniques. Difficulties in obtaining consistent high quality results are described. Results of a study of the effect of operating point and trigger voltage on trigger delay of an avalanche transistor are presented. A method for improving the precision of determining the arrival time of slowly rising and decaying rf pulses is described and schematics shown. Test results on the circuit are not yet available. (Author)

AD-424 284 Div. 30
OTS Price $3.60

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
THE SYSTEM SYSTEM AND BRIDGES OVER THE GULF BETWEEN MAN-MACHINE-SYSTEM RESEARCH AND MAN-MACHINE-SYSTEM DEVELOPMENT,
by J. C. R. Licklider. Jan 62, 33p
Contract AF49 638 355
AFOSR 1673, AFOSR 1127

Unclassified report

Descriptors: (*Computers, Systems engineering), Computer storage devices, Digital computers, Data processing systems, Simulation, Programming (Computers), Information retrieval, Communication theory, Communication systems, Decision making, Computer personnel, Numerical analysis, Design, Performance (Engineering), Operations research.

The need for greater coherence in the man-machine and other high-order interactions of our major systems is described, and an approach to achievement of that coherence is proposed. The approach involves a computer-centered meta-system (the system system) designed to facilitate communication, coordination, and problem-solving. The needs for, and roles of, such a meta-system in various phases of system design, development, production, and operation are discussed. (Author)

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Descriptors: (*O-rings, Bibliographies), (*Bibliographies, O-rings), (*Seals (Stoppers), Bibliographies), Rubber seals, Fuel seals, Hydraulic seals, Oil seals, Gas seals, Metal seals, Rotary seals, Aging (Materials), Compatibility, Friction, Guided missiles, Guns, Waveguides, Submarines.

Information on seals for propulsion-, power transmission-, spacecraft-, fuel-, and hydraulic systems is presented. Design specifications for extreme temperatures, pressures, and space environmental conditions are given. Subjects presented in this bibliography include references to design, configuration, and properties of O-ring seals as applied to guided missiles, submarines, guns, and electrical equipment. Sixty-eight references cited cover a period from March 1953 to February 1963. (Author)

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U.S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field Offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data with national and often State and regional breakdowns, on manufacturing wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

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